X. *Descriptions of some new and rare Cephalopoda.* (Part II.)

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[Plates XXIII.—XXXV.]

SINCE the publication of the paper "On some new or rare *Cephalopoda*," in the second volume of the 'Transactions of the Zoological Society' (1842, p. 103)[1], I have not omitted any opportunity of acquiring and promoting the acquisition of specimens of that class, and now submit to the Society a selection of such materials as seem worthy of forming a second contribution on the subject.

Class *CEPHALOPODA*, Cuvier[2].

Order DIBRANCHIATA, Owen[3].

Suborder Octopoda, Leach[4].

Genus Tritaxeopus, Owen[5].

Species Tritaxeopus cornutus, Owen. (Plate XXIII.)

The 'Poulpes,' or eight-armed Cephalopods, as a rule, bear their suckers in two rows along each arm. But, however numerous and seemingly "opposite" in arrangement, they are "alternate;" and this order becomes more obvious as the suckers are fewer in number and further apart on the acetabuliferous surface. There are also species in which the zigzag course becomes so opened out that the suckers appear to be in a single series, at first along the distal half of the arm, as in *Octopus lechenaultii*; and finally, with a feeble indication of the zigzag at the basal part, the suckers curve in a linear course to the end of the arm, giving the character on which the generic group *Eledone*[6] is founded.

Other genera or subgenera of the Octopoda have been based on marginal extensions of the arm-membranes (*Cistopus*, *Pinnoctopus*, &c.); but I have hitherto failed to find a notice of any Octopod characterized by having the brachial acetabula in three recognizable series along more or less of each arm.

This, however, is the constant character of an Australian species in other respects

[1] Communicated February 23rd, 1836. See 'Proceedings' for that year.

[2] "Céphalopodes," Tableau élémentaire de l'Histoire Naturelle des Animaux, 8vo, an 6 (1797), p. 378.

[3] Memoir on the Pearly Nautilus, 4to, 1832, p. 56.

[4] Zoological Miscellany, iii. (1817); "*Tribus Octopoda*," Trans. Zool. Soc. ii. (1841), p. 129.

[5] τρεῖς, three; τάξις, rank; πούς, foot.

[6] ἐλεδώνη, Arist.; *Eledone*, Cuv.; *Eledon*, Leach.

pretty closely resembling, in average size and in the extent of the basal interbrachial membrane, the common Poulpe (*Octopus vulgaris*) of our own shores. As, however, the acetabular character seems to be of equal distinctive value to that of the opposite extreme connective of *Eledone*[1], I regard the present species as the type of a genus, the character of which has suggested the name above given.

The following are dimensions of my specimen of *Tritaxeopus*:—	in.	lin.
Length of the body	3	9
„ of the head to the division of the fleshy bases of the arms	2	0
„ of the animal to the free margin of the interbrachial web	8	0
Breadth of body at its hinder half	2	7
„ of head, across the eyes	2	3

The arms differ as to length in the order characteristic of the second section of the "Poulpes" in D'Orbigny's monograph[2], and graduate in the special manner seen in *Octopus vulgaris*: viz., the "third" arm counting from the dorsal (1) to the ventral (4) pair, being the longest, the "second" arm is but little longer than the "fourth," and the "first" is the shortest. The length of the "third" arm in the specimen figured (Pl. XXIII. 3) is 1 foot 11 inches, that of the first (ib. 1) being 1 foot 2 inches. The basal thickness of the fleshy part of the third arm is 1 inch; and this dimension does not diminish in the same degree as does the length in the shorter arms. The extent of the basal webs, *a*, *a*, uniting the arms from the base to the middle of the free margin, is $2\frac{1}{2}$ inches between the second (2) and third (3) arms, and $1\frac{1}{2}$ inch between the first (1) and second (2) arms. The proportional magnitude of the "cephalic crown," formed by the arms and their webs, to the body, in *Tritaxeopus cornutus*, is as great as in *Octopus vulgaris*[3].

The integument of the body is beset with scattered wart-like prominences, chiefly on the dorsal aspect; and, of these, four or five of the largest affect a longitudinal disposition.

The tegumentary eyelids are well developed; and each supports prominences on the upper border, of which the two anterior are so large and pointed as to simulate horns, whence the *nomen triviale* of the present species.

The fleshy stem or basis of the arms is, in transverse section, rather semicircular than trihedral. The flat side supports the suckers. They begin at the brachial basis (ib. fig. 2) in a single series, and, alternating in position after the third or fourth, assume the ordinary biserial arrangement; then the two series diverge after

[1] Dr. Gray, in the 'Catalogue of the Mollusca in the Collection of the British Museum,' Part i. (12mo, 1849) —Cephalopoda antepedia—defines the genera *Octopus*, *Cistopus*, *Pinnoctopus*, as having "arms with two rows of cups" (p. 4), in contradistinction from *Eledona* and *Cirroteuthis*, which have "arms with one row of cups."

[2] "B. Bras latéraux les plus longs" (Histoire naturelle générale et particulière des Céphalopodes Acétabulifères,' &c., fol. 1839, p. 17).

[3] M. d'Orbigny remarks on this character of "la couronne:"—"Son volume extraordinaire distingue de suite l'*Octopus vulgaris* des autres espèces" (*op. cit.* p. 28). It applies, however, more precisely, to the female of the species; and the subject of Pl. XXIII. fig. 1 of the present memoir is of this sex.

a short course to make way for the third supplementary row, which extends along the mid line of the acetabuliferous area to the attenuated terminal fourth part of the arm, where the biserial arrangement is resumed. A few suckers at the filamentary termination of the arms fall into the single series with which they began to appear at the base.

All the suckers are sessile. Each expands into a circular disk, the border of which is soft and thick; and therefrom converge a series of thin folds, opening into a central cavity which expands towards the bottom, whence rises a caruncle like the piston of a syringe. The mechanism of the Poulpe's sucker is here repeated. The disk being applied to the surface to be seized, the piston is retracted, and the resultant vacuum converts the disk into a sucker[1]. The number of the suckers of a third arm (3) is 268: there is not more disparity of size between them than in the common Poulpes[2].

The mantle, or body-tunic, is continued into that of the head along the basal breadth of the dorsal aspect of the body (Pl. XXIII. fig. 1, *c*); it terminates anteriorly and ventrally in a thickish free margin. From this wide aperture the "funnel" or respiratory tube projects; its base is not attached or articulated by cup-and-ball lateral cartilages, as in Decapoda; consequently it is more freely movable from side to side, and is commonly seen to project from one or other side, beneath or behind the eye, as at *f*, fig. 1, Pl. XXIII. It is not provided with a valve.

This condition of the funnel, together with the tegumentary protective covering of the eyeball, has relation to the more frequent emergence of the animal from its proper watery element, and its continuance in some recess on shore during low water.

The colour of a *Tritaxeopus* so observed, and undisturbed, is a dullish pink, reflecting from parts of the "crown" a subviolet tint. But when irritated and alarmed it rapidly assumes tints varying from bluish red to deep violet. The inner surface of the coronal membrane, *a*, *a*, is of a lighter tint. The inner circular lip (fig. 2) is whitish.

The mandibles have the usual deep-brown horny texture, the ventral one overlapping the narrower and shorter upper one; both are trenchant, curved, and pointed.

The accessory series of suckers in *Tritaxeopus* may be noted as a step toward the Decapods, more especially the family *Sepiadæ*, in species of which the suckers are crowded into three or more rows on a greater or less extent of the ordinary arms, or on the peduncles or accessory pair[3]. A reciprocal approach to the Octopodal type is indicated by another brachial character, exemplified in the species next to be described.

[1] 'Lectures on the Anatomy of Invertebrates,' 8vo, 2nd ed., 1855, p. 611, fig. 222.

[2] In a few species, *Octopus fontanianus*, d'Orb., *e. g.*, three or four suckers on certain arms form a cluster much larger than the ordinary serial pairs.

[3] In *Cranchia*, as in *Loliginidæ*, the suckers are in two series on the ordinary arms (Trans. Zool. Soc. vol. ii. p. 107, pl. xxi. fig. 4).

Suborder *DECAPODA*, Leach [1].

Fam. SEPIADÆ, Owen [2].

Genus SEPIA, Lamarck [3].

Species SEPIA PALMATA, Ow. (Plates XXIV. and XXV.)

Of the present species the name relates to the great extension of the interbrachial webs (ib. fig. 1, *a*, *a*), to which the nearest approach seems to be made by *Sepia orbignyana*, Férussac [4], and *Sepia elegans*, d'Orb.[5], but in so feeble a degree that their presence is not noted in the text (pp. 273, 280), or shown in the plates "(Seiches) 5 and 8;" the degree in which such webs are developed in these species, however, is given in a subsequent plate, below cited, where an oral view of the head, with arms outstretched, exhibits the slight development of the basal webs in each of the species.

The second specific character of *Sepia palmata* is shown by the fins (ib. *o*, *ó*), which not only commence at the fore part of the body, but extend in advance thereof almost to the degree of the medio-dorsal production of the mantle; the fins are also produced further back than usual, and coalesce (*o'*) beyond the end of the body [6]. In *Sepia latimanus* [7] the fins terminate near the pointed end of the body and leave no notch, but do not unite together.

To the relative proportion of the body to the head with its "corona," in which character the Cuttles come nearer than the Squids to the Poulpes, *Sepia palmata* adds a development of the interbrachial webs equal to that in *Octopus vulgaris* and the species last described (Pl. XXIII.). But the web is not continued in *S. palmata* between the arms of the fourth pair. These, however, develop a narrow fold of the integument from the outer and hinder surface (Pl. XXV. fig. 1, *a'*). The arms decrease in length from the 4th to the 1st, but in a very slight degree from the 4th to the 3rd. The acetabular surface supports four rows of suckers, in the usual alternate relative position. The suckers are small, rather more than hemispheres in shape, supported each by a peduncle attached to one side of their "pole" and giving them an oblique position. The acetabular cavity is small in proportion to its muscular walls, and is lined next its outlet by a broad corneous hoop, the free border of which is finely denticulate. The interbrachial webs

[1] "Cephalopoda decapoda," Zoological Miscellany, iii., 1817. *Tribus Decapoda*, Trans. Zool. Soc. vol. ii. (1841), p. 129.

[2] Trans. Zool. Soc. vol. ii. (1841), p. 129.

[3] Syst. des Anim. sans Vertèbres, 1801.

[4] Hist. Nat. des Céphalopodes, fol., 1835-1848, p. 273 (Seiches), pl. v. and pl. xxvii. figs. 1, 2.

[5] Ibid. p. 280 (Seiches), pl. viii., and pl. xxvii. fig. 5.

[6] The terminal notch between the side fins is so common in the species of *Sepia* that d'Orbigny makes of it a generic character:—"Nageoires—commençant à la partie antérieure même du corps, ou au moins à très peu de distance; le bordant latéralement sur toute sa longueur, en laissant entre elles, en arrière, une forte échancrure" (*op. cit.*, p. 250).

[7] *Op. cit.*, Seiches, pl. xii. fig. 1; Quoy et Gaimard, Zool. de l'Astrolabe, Atlas, Mollusques, pl. ii. figs. 2-11.

contract to their terminal attachment, which is at about one third of the length of each arm from its free pointed end; at the terminal part a ridge is continued from the subsidence of the web along the outer or peripheral side of the arm (Pl. XXIV. fig. 1, *a'*, *a'*).

The tentacles, *d*, *d*, rather exceed the length of the body when outstretched; their comparatively slender subcylindrical stems slightly narrow to their abruptly expanded extremities, *e*, *f*, *g*. These are chiefly formed by the acetabuliferous disk, the proximal end or margin of which, projects freely from the supporting pedicle. The acetabula are somewhat irregularly disposed, and are unequal in size; the four or five largest, greatly exceeding in size those of the arms, are at the middle and rather toward the proximal end of the terminal disk (Pl. XXV. *e*, *e*); they decrease in size towards its circumference to that of the brachial cups. The dorsal surface of the cup-bearing disk is transversely furrowed (Pl. XXIV. fig. 1, *f*); the border of the tentacle opposite that which supports the disk is produced into a narrow fold or "velum" (ib. *g*). The large cavity or sac into which the tentacles can be withdrawn is situated beneath or on the ventral side of the eyeballs: the wrinkled disposition of its parietes in the empty state is shown at *h*, *h* (Pl. XXV. fig. 1).

The aquarium enables the home-naturalist to comprehend the use of this complex mechanism of cephalic prehensile organs. The Cuttle makes a hollow in the submerged sand on which it rests; the tentacles are drawn in, out of sight, the arms are contracted and collected *en masse*, as in the cut, fig. 1. If a fish should glide or a crab crawl within

Fig. 1.

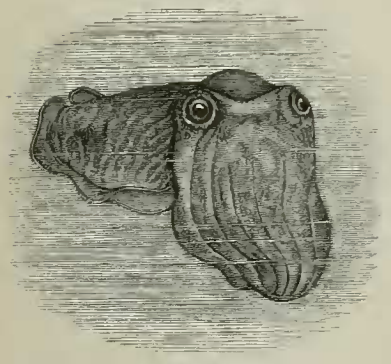
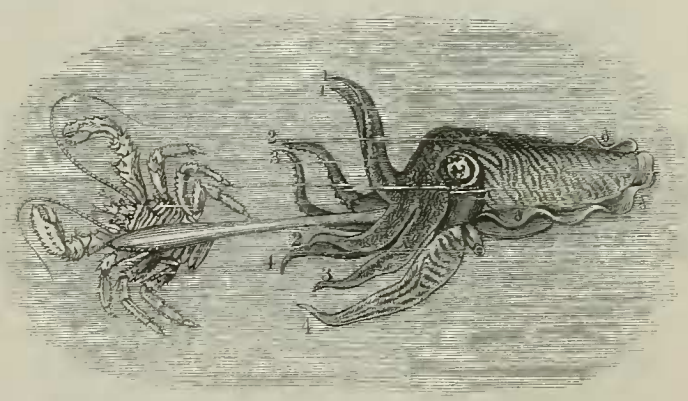


Fig. 2.



sight or smell, the Cuttle is roused, opes wide its eyes, separates and stretches out its arms, and manifests its emotion by change and heightening of its colour; it then moves craftily to the correct distance, takes aim, uplifts the dorsal pair of arms (1), divaricates the side pairs (2, 3, 4), and, darting out the tentacles, seizes and draws in the prey with a rapidity the eye can scarcely follow (fig. 2)[1].

[1] I am indebted for this statement, and the drawings from which figs. 1 and 2 are taken, to my late esteemed friend Mr W. A. Lloyd, Conductor of the Aquarium at Westminster, and lately in charge of that at the Crystal Palace. The same phenomena have been witnessed at the Brighton Aquarium.

The outer lip in *Sepia palmata* is attached to the velum at the interspaces of the arms. From that between the first pair a fold extends and expands upon the inner border of this circular lip, and develops therefrom a short tentacle, of a bright red colour in the recent Cuttle. A similar fold and process extend from the interspace between the second and third arms, and from the sheath of the tentacle between the third and fourth arms. A pair of similar folds of smaller size and developing shorter pointed processes, are continued upon the outer lip from the interspace between the fourth pair of arms. The fold of the outer lip developing the pink processes may be regarded as a middle lip. The inner circular lip immediately surrounding the mandible has a fringed external border. The above characters are shown in Plate XXV. fig. 1.

The head of *Sepia palmata* has the usual proportions of the genus, broader than long, but here in breadth not quite equalling that of the pallial aperture; it contracts to a kind of neck behind the eyes. These (Pl. XXIV.) are more dorsal in position than in Octopods, are not visible on the ventral surface (Pl. XXV.), on which the Cuttle rests and lurks in wait for its prey. The cephalic integument is continued over the eye-ball, but becomes transparent opposite the iris, the curtain of which (Pl. XXIV. *i*) is visible and notable in the present as in other *Sepiæ*. There is a slight fold indicative of a lower lid, *k*; the upper one bears posteriorly three caruncles regularly disposed. Anteriorly is the small orifice of the lacrymal sac.

The dorsal part of the head, between the orbits, shows a depression lodging the anterior production, *m*, of the mid part of the dorsal border of the pallial aperture: into this production enters the fore part of the "sepium" (Plates XXIV. & XXV. fig. 2). A corresponding depression on the ventral side of the head, between the tentacular sacs, lodges the funnel (Pl. XXV. fig. 1, *n*).

The fins, *o*, *o'*, produced from the entire side-border of the mantle or body-wall, nearer the dorsal than the ventral surface, extend forward in an unusual degree; and continuing backward, they round the hinder end of the body, meet, coalesce, and extend beyond that part, *o'*.

The superior degree of development of these forward-propelling instruments may be correlated with the superaddition of the backwardly propelling webs, *a*, *a*, in the present doubtless very active Cuttle. In connexion with the characteristic hinder production of the fins may be noted the absence of the "mucro" or pointed terminal apex of the "guard" of the reduced and modified belemnitic shell, which mucro usually projects, in other species of *Sepia*, from the notch left at the posterior interval of the there separated lateral fins.

Besides the absence of the mucro, the "sepium" of *S. palmata* differs from that of *S. officinalis* and most other Cuttles in tapering more gradually to the hind end, in the greater proportion of the sheath to the phragmocone, and in the lateral margins of the sheath being well definable, and extending beyond the lamellate mass from end to end.

The dorsal surface of this mass or "phragmocone" has a subtrilobate form (Pl. XXIV.

fig. 2, *b*), the mid lobe more prominent than the side ones *b'*; on the ventral surface (Pl. XXV. fig. 2) the hinder two thirds of the mid lobe, *b*, are traversed by a median longitudinal groove. This is barely indicated in the sepium of *S. officinalis*, but is continued through the whole length of the same part and surface of the sepium of *S. australis*, d'Orb.[1], which has a sharp and slender well-produced "mucro." The specific characters of the sepium of *S. palmata* are well brought out in a comparison of the figures of that part in the plates of the richly illustrated work of the French cephalopodists. The form which comes nearest to the sepium of the present species is that of *S. longimanus* of Quoy [2].

The colour of *Sepia palmata*, in the quiescent state of the Cuttle, is a dull or dirty subviolet-pinkish.

The subject of Plates XXIV. and XXV. was captured off the shore of Norfolk Island, Australia. The figures are reduced to three fourths of the natural size.

Genus Sepioteuthis, Blainville [3].

Species Sepioteuthis brevis, Owen. (Plate XXVI. fig. 1.)

The present form of Decapod agrees with *Sepia* in the extent of attachment of the lateral fins (ib. *e*, *e*); but the development of the internal shell is restricted to the sheath, or part homologous with the "guard" of the Belemnite, the chamber-walls of the phragmocone not being developed, and no part of the shell being calcified.

Of this form I have received a specimen from the Japanese sea, the arms of which had suffered some mutilation; but the proportion of the body to the head, of the breadth of the body to its length, and the narrowness of the lateral fins forbade its reference to any of the previously described or defined species of *Sepioteuthis* to which, or to their descriptions, I have had access.

I submitted the specimen to dissection, found that it was of the male sex; and, as these organs have not, to my knowledge, hitherto been made known in the genus *Sepioteuthis*, I add a figure of them, *in situ*, to the few remarks now submitted on the characters of the species.

The head is short and broad across the eyes. These have a tegumentary covering, transparent as in *Sepia*, and leaving the curtained iris (ib. fig. 1, *m*) visible. Behind the prominence of the eye-ball a low ridge of integument, with a subcrenate border, *n*, extends in a parallel curve, and, from its relation to the acoustic *foramen*, has been compared to an external ear [4].

The cephalic arms are short, provided on their dorsal or peripheral surface with a longitudinal tegumentary fold, *a'*, and on the opposite surface with two rows of acetabula

[1] *Op. cit.* p. 285, pl. (Seiches) 7, fig. 4.

[2] Zoologie de l'Astrolabe, fol., tom. ii. p. 68, Mollusques, pl. 2. figs. 2, 11.

[3] Malacologie, 8vo, 1823 (syn. *Chondrosepia*, Leuckart, 1828).

[4] "Oreille externe," d'Orb. *op. cit.* p. 297.

in the usual alternate disposition (Pl. XXVI. fig. 1, 1, 3). The dorsal pair (1) of arms are the shortest and most slender; the third and fourth (ventral) pairs are the longest and thickest. Only the basal part of the stem of the left tentacle, *p*, remains in the specimen described.

On each side of the base of the funnel is a narrow elongate cartilage, *q*, excavated for the reception of a cartilaginous prominence, *r*, of similar form, from the juxtaposed inner surface of the muscular mantle. The infundibular tube is shown slit open along the ventral wall, exposing the terminal valve, *s*. The masses of the "musculi retractores infundibuli" are shown at *t*, *t*. The anterior or descending aorta, *u*, is drawn from the intervening recess of the above muscles. The posterior aorta has been removed near its origin, *v*. The systemic ventricle is transversely elongate and bent at a right angle, as in *Sepia*.

The vena cava, *w*, is partly withdrawn from the intermuscular recess; and its two divisions, with their glandular tunics, are shown diverging to the lateral branchial hearts, *x*, *x*, each of which has a small fleshy appendage. The margin of the gill lodging the branchial vein is shown at *y*. The trunk of each vein enters the contiguous end of the transverse ventricle, the right rather more advanced than the left. The branchial lamellæ are narrow and numerous.

The digestive viscera, agreeing closely with those of *Sepia*, have been removed to bring more clearly into view the circulatory, respiratory, and generative organs. A part of the liver, with its peritoneal capsule partially reflected, is shown at *z*.

The testis, *a*, occupies a peritoneal compartment at the hinder end, or fundus, of the abdominal cavity; on removing the serous coat, as in the figure, the fibrous tunic is exposed. To a part of the inner surface of this membrane are attached the seminal tubes, which diverge and branch dichotomously, filling the cavity, and terminating blindly. They are bathed in the seminal fluid, which escapes by rupture of the tubules into the fibrous sac, whence it escapes by a foramen leading to a long, slender and tortuous "vas deferens." This tube opens into a larger one, the size of which is chiefly due to the thickness of its fibrous and glandular parietes, which present narrow transverse plicæ toward the cavity of the present canal, which has been termed a "vesicula seminalis:" it is shown at *c*. The anterior end of the "vesicula" communicates with a second, oblong, blind glandular sac (ib. *d*): it has been compared to a "prostate gland." Without sanctioning such homologies with the parts so called in the mammalian class, it is certain that the seminal fluid or spermatozoa are packed into capsules, contributed by the glandular parts of the above accessory organs, the capsules being therein moulded into the filamentary form. These "spermatophora" are conveyed by a short and wide duct to an oblong pouch, *f*, sometimes called (after the naturalist and theologian who first drew attention to the moving powers of the filaments) "Needham's pouch" (*bursa Needhami*). A short canal conducts the spermatophores to the base of the penis, *h*.

Genus Sepiola.

Species Sepiola oweniana, d'Orb.

I subjoin a description and figure of the male organs of *Sepiola oweniana*, d'Orb.[1] (Pl. XXVI. fig. 2) for comparison with those of *Sepiola grantiana*, d'Orb.[2], from which the difference of the subject of fig. 2, Pl. XXIV. is so great as to lead me to conclude that the complexities of the organs had failed to be unravelled by the deservedly esteemed French authorities on the present highly organized class of Mollusca.

In *Sepiola oweniana* the testis (ib. fig. 2, *a*) is pyriform, convex on one side, the opposite surface converging to a low ridge, from which the sperm-duct (vas deferens, *b*) is continued. This duct is relatively shorter and has fewer convolutions than in *Sepioteuthis*. The "vesicula seminalis," *c*, is relatively longer, more slender, and shows a short fold in its forward course. The prostate, *d*, is rounded, its secretion is carried into the fore end of the "vesicula" by a relatively longer duct than in *Sepioteuthis* and *Octopus*. The duct, *e*, proceeds from the confluence of those of the vesicula and prostate, and, describing a turn round the hinder and smaller portion of the spermatophorous pouch, opens into its fundus. This pouch, *f*, is relatively larger than in *Septioteuthis* or than in *Octopus*[3]; it is oblong, partially divided into two compartments by the slight constriction along which the vesiculo-prostatic canal curves. The spermatophorous duct, short and wide, *g*, comes off near to the large anterior end of the pouch, and conveys the movable "filaments of Needham" into the base of a conical penis, *h*.

Fam. TEUTHIDÆ, Owen[4].

Section *a*[5].

Subfam. Loligopsinæ, d'Orb.[6]

Genus Loligopsis, Lam.[7]

Species Loligopsis ocellata, Ow. (Plate XXVI. figs. 3–8, & Plate XXVII.)

This species, in the relative magnitude of the head and shortness of the trunk, departs from the generic character derived by d'Orbigny from the few specimens of the singularly modified Decapods forming Lamarck's genus "*Loligopsis*" at the date of publication of the great work quoted below[8]. Nevertheless the essential characters of the

[1] *Op. cit.* p. 229.
[2] Ibid. *Sepiola*, pl. ii. fig. 11.
[3] See Cuvier, Mémoires &c. des Mollusques, 4to, 1817, "Poulpe," pl. iv. fig. 5, *e*.
[4] Trans. Zool. Soc. vol. ii. p. 129.
[5] Ibidem (1836).
[6] *Op. cit.* p. 320 (1835–1848).
[7] Extrait du Cours d'Hist. Nat., 1812.
[8] "Genre *Loligopsis*, Lamarck. *Animal* pourvu d'une tête très petite par rapport à l'ensemble, et d'un corps très allongé.—"*Op. cit.* p. 320: fol., 1839.

genus are exemplified in the combination of the large naked eyeballs, the large and loose funnel (extending, when not reflected, as at *m*, Pl. XXVII. fig. 1, to the interspace of the eyeballs), the short but broad and here rounded terminal fins, *k*, *k*, and the very long, slender, and seemingly non-retractile tentacles, *t*.

The head, of which the prominent eyeballs, *o*, *o*, form the broadest part, is not contracted at its fore part, and is but very slightly so behind. There is no lacrymal depression, nor any rudiment of eyelids. A series of small spots around the margin of the wide orbit scarcely rises above the surface. The iris or capsule of the lens seems to be naturally exposed; the conjunctiva, *p*, continued from its periphery, is reflected upon the back part of the eye-globe as far as the entry of the nerves from the optic ganglion; the long diameter of the lens is in the line of its axis.

The cephalic arms are subequal, moderately long. Those of the dorsal pair (Pl. XXVII. 1, 1) are each 5 inches in length and 5 lines in basal breadth, those of the ventral pair (ib. 4, 4) are each $5\frac{1}{2}$ inches in length and are rather narrower at the base. Each arm presents a quadrate transverse section, being tetrahedral (Pl. XXVI. fig. 4); the inner or central angles (ib. ib. *e*, *e*) are fringed with a very narrow delicately scalloped membrane, to the inner side of which the suckers, *f*, *f*, are attached each by a slender pedicle (fig. 5, *p*). The three pairs 1, 2, 3 of arms are attached to each other at their bases by two small webs, the broader one at the central, the narrower one at the peripheral angles; the arms 3 and 4 are connected basally by the peripheral web, *g*, only, which is broader than in the others, and forms the outer wall of the depression lodging the base or root of the tentacle. The tentacles, *t*, *t*, arise close together from a glistening mass of ligamentous substance at the inner part of the ventral side of the head, a little in advance of the orbits, whence they diverge to issue at the interspaces between the arms 3 and 4.

There seems not to be any cavity capable of receiving them entire in a retracted state, as in the ordinary Squids and Cuttles. Their clavate acetabuliferous ends, which may be supposed to have existed from the analogy of other species of *Loligopsis* (*L. veranii*, e. g.), in which the tentacles were fortunately entire in the captured specimen, have been broken off in the present instance, as in the species *Loligopsis cyclura*, Lesueur, figured in the first volume of the Society's 'Transactions,' pl. ii. p. 21, as *L. guttata*, Grant; and in *Perothis pellucida*, or *Perothis escholtzii*, Rathke[1].

The brachial acetabula, attached or, as it were, suspended to the central borders (figs. 3, 4, *e*, *e*) of the ordinary arms, are small, not exceeding $1\frac{1}{2}$ millim. at their base; this adheres by a short and pyriform peduncle (fig. 5) to, or close to, the brachial fringes. They are consequently in two series, of which the alternate arrangement is feebly shown. The two rows are as distinct at their basal beginning as in the rest of the course

[1] Mém. de l'Acad. Imp. des Sciences de St. Pétersbourg, tom. ii. p. 159, pls. 1 & 2. This species is held by d'Orbigny to be identical with the *Leachia* (*Loligopsis*) *cyclura* of Lesueur. I have added in outline, to one of the broken tentacles in pls. v. & vi., the clavate end as figured in pl. viii., d'Orb. *op. cit.*

(Pl. XXVI. fig. 3). They slightly enlarge toward the middle of the arm, and thence gradually decrease in size to the attenuated end. Each sucker is subspherical (Pl. XXVI. figs. 4, 5, 5′); the aperture of the cavity is circular, with a tumid margin; and the corneous lining terminates there by a finely spinous border.

The outer lip, or buccal membrane (Pl. XXVI. fig. 3, *h*), is from 7 to 8 lines in breadth; the free border is produced into seven angles, corresponding to the places of attachment of as many brachial "frœna" to the outer surface of the lip. Of these the dorsal one, *i*, is azygous and rises from the web at the basal interspace of the dorsal pair of arms 1, 1. The contiguous pair of frœna are similarly attached to the basal webs between the first and second pairs of arms. The frœna of the third pair are attached to the beginning of the ventro-marginal fringe of the third arm; those of the fourth pair are attached to the beginning of the contiguous marginal fringe of the fourth pair of arms. The labial processes corresponding to the frœna are simply pointed and short, not acetabuliferous. The surface of the outer lip, extending from the scalloped border to the inner lip, is finely villous. A narrow simple border, *i*, is developed from the continuation of the outer to the inner or proper lip. This lip is thicker, more muscular, and shows a crenate (hardly to be called fringed) border. The point of the ventral mandible is exposed in fig. 3 (Pl. XXVI.).

The rostral part of the upper dorsal mandible (ib. fig. 6, *a*) is short and stout, and sends down from its basal half a broad process, *b*, making the vertical diameter of the rostrum equal to the entire length of this mandible. The apophysis, *c*, is subquadrate. The rostrum of the lower ventral mandible (fig. 7, *c*) is longer and more acute, and has no basal process; its upper border is continued at *f* upon the apophysial part; the apophysis, *g*, is relatively more extensive than in the upper mandible; and the lower angle is produced.

The length of the specimen of *Loligopsis ocellata* here described, from the tip of the longest outstretched arm to the end of the body, is 1 foot; the length of the head with its brachial appendages is 7 inches 9 lines; the length of the body, less the funnel, is 4 inches 3 lines. The transverse diameter of the fore part of the body is 2 inches 3 lines.

Halfway toward the hind end the body gradually contracts thereto, and terminates in an obtuse point between the bases of the fins. The fore border of the mantle is produced into a low angle at the middle of the dorsal side (Pl. XXVII. fig. 2, *f*). The fins (ib. fig. 1, *k*, *k*) are subcircular, attached for an extent of 1 inch 1 line to the sides of the hind part of the mantle, rather nearer the dorsal than the ventral surface. The combined breadth of the fins is 2 inches 6 lines; the longitudinal diameter of each is 1 inch 2 lines.

The colour of the specimen when first received was crimson shading to violet, with dark spots, brightest on the ventral and lateral surfaces. The spots average 1 line in diameter, are circular or full-elliptical in shape, with a white centre; their resemblance

to so many little eyes suggested the "nomen specificum." On the arms they are limited to the outer or peripheral facet, and thereupon are well marked, arranged in an irregular triple row along the basal third, and in a double row for the rest of the extent. The ground-colour is fainter on the contiguous brachial facets, but is as well developed upon the central as on the peripheral facets of each arm. The tentacles and fins showed little or no pigment.

The funnel is of large proportional size, extending along the ventral side of the head almost beyond the space between the eyes. Its free exserted part is shown, reflected, in Pl. XXVII. fig. 1, *m*. On each side of its intrapallial base is the cartilaginous socket, 9 lines in length by 3 lines in breadth, for articulating with the corresponding cartilaginous prominences on the opposed inner surfaces of the mantle. Coexisting with this articular apparatus ("appareil de résistance," d'Orb.) is the infundibular valve.

Both the above structures of the funnel, common, as a rule, in Decapods, are either nonexistent or unnoticed in previously described species of *Loligopsis*[1].

The gladius or pen of *L. ocellata* (Pl. XXVI. fig. 8) is 4 inches 5 lines in length, 9 lines in extreme breadth. The shaft, *r*, extends forward about 9 lines in advance of the vane, *s*, but is continued along the mid line of that part, gradually attenuating, to the subobtuse end, which occupies the interpinnate prominence of the body. The shaft commences in the medio-dorsal production of the fore part of the body. The vane gains its extreme breadth about one fourth of the way to the hind end, toward which it gradually narrows. This likeness of the "gladius" to the feather, the present species of *Loligopsis* shows in common with most of the ordinary squids (Loliginidæ). In *Loligopsis veranii* there is a vane-like expansion at both ends of the gladius, with a long intervening slender shaft[2]. In *Loligopsis pavo* the fore part of the shaft is longer than the hind part supporting the vane[3]. A similar shape of gladius occurs in *L. cyclura* (*L. guttata*, Grant)[4].

The following are from notes taken on dissection of the specimen above described:—

The cartilaginous cranium presents on its dorsal aspect a general convexity with a transversely cordiform outline, the point being anterior, the notch posterior. The ventral surface offers two lateral convexities, with a middle longitudinal channel perforated by the two large pallial nerves and, above them, by the large vein. Two muscles of the eyeball arise from the lateral part of the anterior margin, about a line apart; they converge and expand upon the sclerotic. A second muscle arises from the mesial surface near the hind edge of the ventral plate of the cranium, and expands upon the corresponding surface of the eyeball. A third muscle passes transversely between the two

[1] Op. cit.: *L. pavo*, d'Orb., p. 321; *L. cyclura*, Vér., p. 322; *L. peronii*, Lam., p. 323; *L. chrysophthalmus*, d'Orb., p. 324. Amongst the infundibular characters of the genus is "l'intérieur simple, sans valvule," p. 321. I am unwilling to propose a generic name on the difference above noted in the present specimen.

[2] Op. cit. "*Loligopsis*," pl. ii. fig. 3. [3] Ibid. *Loligo*, pl. vi. fig. 4. [4] Ibid. p. 322.

eyeballs, anterior to the ventral border of the cranium. The muscles of the "corona" come from both dorsal and ventral surfaces of the cranium.

The gullet is long, slender, without partial dilatation. The stomach is an oblong cæcal pouch, an inch in length. The pylorus, situated near the cardiac orifice, conducts by a very short canal to the second, spirally disposed, pouch, the blind end of which forms only a single turn with an obtuse apex. The intestine makes a single bend forward, is short, and at its anal termination is provided with a pair of slender tentacles, each $1\frac{1}{2}$ line in length.

The liver consists of a single oblong elliptical mass, 2 inches in length, 9 lines in breadth; its capsule shows a glistening surface. Two hepatic ducts emerge from its hinder end, each about an inch in length, and developing clusters of quasi-pancreatic follicles. Beyond these the ducts open upon a groove continued from the spiral glandular pouch into the beginning of the intestine. The ink-bladder is fusiform, narrow, coextensive with and parallel to the straight terminal part of the alimentary canal, with the termination of which it communicates by a short and wide duct. Each branchia consists of 40 pairs of plicate plates; the suspensory folds are coextensive with the gill. Each branchial heart is simple, without appendage. But on the division of the vena cava leading thereto is the usual glandular supposed "renal" organ; its capsule is thick and pulpy; and it communicates with the abdominal cavity by a widish opening with a coloured margin. The size of each renal sac was 1 inch by 9 lines.

The systemic heart is of an elongate lozenge-shape, receiving the branchial veins at nearly opposite transverse angles, near the fore part of the ventricle. This sends off one large posterior aorta and a smaller anterior artery. The peritoneal or lining membrane of the mantle is reflected upon the viscera about an inch behind the anterior free border of the mantle, and also from the capsule of the gladius, along which it is attached. The two chief lateral nerves of the muscular mantle are each accompanied by a more slender nerve, which expands into the stellate ganglion from which radiate the nerves to the anterior third part of the mantle. From the hind end of the ganglion a small nerve is continued on, parallel with the unganglionic chord, to the attached bases of the terminal fins, which thus derive their nervous supply from both the sensory and motory chords. The sex of the specimen was female; the organs of generation were as in *Loligopsis cyclura*[1].

I am indebted to Tradescant Lay, Esq., for the subject of the above description, which was captured in the Chinese sea.

[1] *L. guttata*, Grant, Trans. Zool. Soc. vol. i. pl. ii. fig. 3, *g*, figs. 8, 9.

Genus Ommastrephes, d'Orbigny[1].

Species Ommastrephes ensifer, Ow. (Plate XXVIII.)

In the family of Squids (Loliginidæ), to which the present specimen belongs, the group differentiated by d'Orbigny under the generic name above given includes it by the form of the lateral cartilages on the inner surface of the mantle and of the cavities on the sides of the base of the funnel adapted thereto[2], by the absence of eyelids, and by the orifice of the eyeball (Pl. XXVIII. fig. 1, *o*), with which is associated the depression in the integument anterior to the eye, termed "lacrymal sinus," *l*.

In this group the species *Ommastrephes bartramii*, Le Sueur[3], and *O. oualaniensis*, d'Orbigny[4], come nearest to *O. ensifer* in the development of the tegument forming the ventral margin of the acetabuliferous tract of the second (ib. 2 *a*) and third (ib. 3 *a*) arms. But such development is much exceeded, especially in the third arm, in *O. ensifer*; it is moreover associated with a production of the integument of the outer ridge or surface of that arm, in a subangular form (ib. 3 *b*), which expansion, combined with that of the acetabular velum (*a*), gives to the third arm the shape of an eastern scymitar, whence the specific name proposed for the present species. Should this be deemed a character of subgeneric value, I would propose the term "*Xiphoteuthis*"[5] for the present and other species that may be found to possess it.

The following are dimensions of the individual on which the species is founded:—

	in.	lin.
Length of body	15	6
„ of head to interspace of dorsal arms 1	3	7
„ of arms 1	8	9
„ of arms 2	11	0
of arms 3	12	0
of arms 4	9	6
„ of tentacles (outstretched)	21	0
„ of attached base of fin	6	6
Breadth of the pair of fins	12	6
„ of body in advance of fins	4	0
„ of fore end of body	5	0
„ of head across the eyes	4	0
Breadth, extreme, of arm 2	1	6
„ „ of arm 3	3	0

Total length from apex of body to end of outstretched tentacles 3 feet.

[1] Histoire Naturelle des Céphalopodes Acétabulifères, 4to, 1835–1848, p. 341.

[2] *In op. cit.* described as the "appareil de résistance," p. 341.

[3] Journal of the Academy of Natural Sciences, Philadelphia, for 1821, p. 90, pl. vii.

[4] *Op. cit.* p. 351, 'Ommastrephes,' pl. i. 'Calmars,' pl. iii.

[5] ξίφος, sword; τευθίς, squid.

The free (anterior) border of the mantle, or body-wall, is even, not produced as in most *Loliginidæ* into a point, either at the mid line of the dorsal aspect (Pl. XXVIII.), or at any part of the ventral one. The part of the funnel projecting from the latter aspect, rests in a recess on the corresponding surface of the head, like a cannon in its carriage. Such provision, added to the complex basi-lateral joints of the expulsatory tube, must, by increasing its resistance to the force of the ejected respiratory current, correspondingly increase the reacting force of that ejection in the movement of the mollusk.

The fins (ib. *e*, *e*) are attached to two fifths of the terminal part of the body; their united breadth is twice that of the length attached. They are relatively larger, more powerful, organs of natation than in either of the above-cited species of *Ommastrephes*.

The outer circular lip has its attachment to the bases of the arms strengthened, as in *Loligopsis*, by narrow muscular ridges or frœna, which are here continued at one end upon the inner side of the base of the arm for a short distance, ending in a point, and at the other end extend to the apex of the triangular process (ib. *f*) of the outer lip. These labial processes are not acetabuliferous, as in many Squids[1]. The two inner lips, answering to those in *Octopodidæ*, are also present.

The chitinous substance of the beak is rather thin, but hard enough at the sharp-pointed tip for its prehensile function in this piscivorous Cephalopod. The longer (under or ventral) mandible (ib. *v*) shows basi-lateral expansions notched at the hind border. The shorter (dorsal) mandible is without such side plates.

The acetabula are in a double alternate series on each arm, are relatively small, sub-dilated at the base, which is attached by a longish subcentral pedicle (Pl. XXVIII. fig. 2); the cavity is bounded by a slightly tumid circular lip lodging the base of a hoop of chitine, the free border of which is denticulate, with some of the teeth longer than the rest.

The acetabuliferous expansion of the tentacles (ib. fig. 1, *t*) supports a double alternate row of larger, similarly armed, subsessile cups, and a third series of somewhat smaller ones. These diminish in size and number towards each end of the cupped surface.

In most species of *Ommastrephes* one or more pairs of the ordinary arms have the outer surface, or that opposite the cup-bearing one, not rounded, but ridged longitudinally, the two sides inclining from the acetabuliferous borders to such ridge. In *Ommastrephes sagittatus* the ridge is slightly prominent in the second pair, and partially produced in the third pair of arms, forming a narrow dorsal fold or "velum." In *O. bartramii* the fold, or fin-like development of skin is continued from the whole length of the dorsal ridge, and a second fold or "velum" is developed from the outer border of the series of suckers in the second and third pairs of arms.

[1] "Descriptions of some new and rare Cephalopoda," Proceedings of the Zoological Society, 8vo, 1836, p. 106. "In this repetition of the structure of the external series of cephalic processes there is an evident analogy to the different series of labial processes of *Nautilus*."—Ibid.

Both dorsal and ventral brachial cutaneous folds, or "vela," are greatly developed in *Ommastrephes ensifer*, more especially in the third pair of arms (Pl. XXVIII. fig. 1, 3); and in these the disposition of the muscular fibres for contracting or folding the web or net is indicated through the integument (ib. *a*). A fasciculus is continued from the base of the peduncle of each sucker of the outer row, which extends with a slight curve toward the free border of the ventral web, and expands as the fibres spread out to terminate in that border.

In the extent of this brachial membrane the present species of Decapod comes nearest to that form of Octopod (the Argonaut) in which the tegumentary expansion of a certain pair of arms is in excess. In *Argonauta* the so-called "sails," we know, relate to the formation and support of a rudimental shell. Although no such relation can be predicated of the brachial vela of our female *Ommastrephes ensifer*, it may be a question whether they are equally developed in the male. Should he similarly possess them, it may then be supposed that, by means of such brachial developments, the fish which has been struck by the spines of the horny rim of the suckers may be enveloped by the webs, which can be so wrapped about it as more effectually to retain it till the other acetabuliferous arms are brought to bear upon the prey.

Cephalopods have been sometimes figuratively called "sea-spiders;" and in the present species we see something superadded to the prehensile spiny-crowned suckers analogous to that with which the air-breathing Octopod envelops the struggling wasp or blue-bottle in a rapidly outspun web.

In the mechanism for catching its finny prey exemplified in the above-noted characters of *Ommastrephes ensifer*, we recognize a power of obtaining a supply of nutriment favourable to the acquisition of the bulk which the subject of the present description had attained. If, in place of the spiny hoop, each sucker were armed with one large hook, an oceanic swift-swimming Cephalopod would have increased power over the shoals of fishes whence its nutriment was derived, and still greater dimensions might be concomitantly attained.

Genus Onychoteuthis, Lichtenstein[1].

A much larger Cephalopod, parts of which have come under my observation, is that which received the following notice in Hawkesworth's 'Account of the Voyages of Discovery in the Southern Hemisphere, successively performed by Commodore Byron and Captains Wallis, Carteret, and Cook'[2].

In the 2nd volume ("Lieut. Cook's Voyage"), H.M.S. 'Endeavour' having rounded Cape Horn, and being then in latitude 38° 44′ S. and longitude 110° 33′ W., is the following entry, of date between the 1st and 8th of March, 1769:—

[1] Das zoologische Museum der Universität zu Berlin, no. xv. (1818), p. 1592.

[2] In 4 vols. 4to, 1773.

"Mr. Banks also, about this time, found a large cuttle-fish, which had just been killed by the birds, floating in a mangled condition upon the water; it was very different from the cuttle-fishes that are found in the European seas; for the arms, instead of suckers, were furnished with a double row of very sharp talons, which resembled those of a cat, and like them, were retractable into a sheath of skin, from which they might be thrust at pleasure. Of this cuttle-fish we made one of the best soups we had ever tasted" [1].

The grounds on which I formed a personal acquaintance with such débris of this remarkable Cephalopod as might have remained, after it had furnished Lieut. Cook and his scientific fellow-voyagers, Banks and Solander, with a welcome change of diet, are the following:—

When preparing, in 1829, my first 'Catalogue of the Hunterian Museum'[2], being struck with the number of marine oceanic Invertebrata, dissected and undissected (*Salpæ*, nos. 119 D, 120, 121–128; *Pyrosoma*, no. 119 C; *Janthina*, nos. 154, 155; *Boltenia*, no. 119), which Hunter had obtained, I was informed by Mr. Clift that his Master had supplied Mr. (afterwards Sir Joseph) Banks with wide-mouthed stoppered bottles, containing alcohol, for the preservation of such marine animals in a state fit for dissection, as might be captured in the circumnavigatory voyage about to be undertaken by Lieut. Cook. Some of Hunter's bottles containing the above specimens bore a label, J. B., as noted in the 'Catalogue.' It was probable, therefore, that Sir Joseph Banks might have stowed viscera and other portions of the great Hook-armed Cuttle in one of the bottles for his anatomical friend.

In preparing the second Catalogue of the series of dissected specimens I came upon the following parts of such a Cephalopod:—

Portions of the arms (Pl. XXXII. figs. 1, 2, & 3)[3]; a beak with the tongue, radule, and surrounding lips (Pl. XXXI. fig. 1)[4]; a systemic heart-ventricle (Pl. XXXII. fig. 6)[5]; and, among the "Dry Preparations" was the terminal part of the body with an attached pair of rhomboidal fins of a Cephalopod (then No. "1436," now "E. 1066") answering in size to the above specimens in spirits (Pl. XXXI. figs. 2–4, reduced).

The heart, or part of that complex circulating apparatus in Cephalopoda, differed moreover in shape from the systemic ventricle in Octopoda and Sepiadæ; and I found the nearest approach to it, in form, in a small kind of Squid which had hooks upon the expanded ends of the tentacles[6].

[1] *Tom. cit.* p. 70.

[2] 'Catalogue of the Contents of the Museum of the Royal College of Surgeons in London. Fasciculus I., comprehending the First Division of the Preparations of Natural History in Spirit (*Vegetabilia* and *Animalia evertebrata*)', 4to, 1830, p. 33.

[3] *Op. cit.* p. 33.

[4] 'Descriptive and Illustrated Catalogue of the Physiological Series of Comparative Anatomy in the Museum of the Royal College of Surgeons in London,' vol. i. 4to, 1832, p. 15, no. 63; 2nd ed., 8vo, 1852, p. 15, no. 63.

[5] Ibid. vol. ii. 4to, 1833, p. 84, no. 308; 2nd ed., 8vo, 1852, p. 84, no. 308.

[6] Descr. and Ill. Cat. vol. ii. no. 902 A, p. 35; and no. 166 D, Nat.-Hist.-Series Cat. *ut suprà*, p. 33.

The hook-armed Calamaries designated under the generic name *Onychoteuthis* by Lichtenstein have since been separated and grouped under other genera, of which the two best-marked are distinguished by the disposition of their peculiar weapons.

In one group the hooks or claws are restricted to the tentacles; in the other they are developed upon both arms and tentacles.

To the first of these Calamaries the original generic term is now restricted, as the type species (*Onychoteuthis banksii*[2]) exemplifies such partial location of the hooks.

The term *Enoploteuthis* is applied, by d'Orbigny, to the group in which the arms as well as the tentacles bear hooks. A fossil species similarly provided has been termed *Acanthoteuthis*. Other genera have been proposed on minor modifications[3], but have not met with acceptance.

I propose to offer some anatomical observations derived from a species of the first genus, before describing the preserved parts of the large example of the second genus of these most formidable Dibranchiate Cephalopods.

The first observations are results of a partial dissection of a unique specimen of *Onychoteuthis* (*O. raptor*, Ow.), nearly allied to the type species.

My subject (Pl. XXIX. figs. 1 & 2) is 8 inches 6 lines in length, of which the body gives 5 inches 8 lines, including the infundibulum. The fins are rhomboidal and terminal, 3 inches 2 lines across, and each of a length of 2 inches 8 lines. The arms decrease in length from the ventral to the dorsal pair, but not consecutively, their order, as to length, being 4, 2, 3, 1. Each is provided with a double row of small pyriform sessile acetabula. The swollen extremity of each tentacle, *t*, supports a double series of hooks, each projecting from a subelongate fleshy capsule; there are about 15 in each row, the outer ones being the longest: at the base of the uncigerous expansion is a circular group of small acetabula, *t'*, the function of which is specially noted in the article Cephalopoda[4] of the 'Cyclopædia of Anatomy.'

The eyes repeat the character of the Ommastrephic group, as noted in *Ommastrephes ensifer*, except that the "lacrymal fossa" is less marked.

[2] *Loligo banksii*, Leach, 'Zoological Miscellany,' 1817, no. iii. p. 141, and Appendix to Tuckey's 'Narrative of the Congo Expedition,' no. ii. p. 401. The specific name was given by Dr. Leach, under the impression that the small hook-armed Cuttle caught off the coast of Africa might be the species noted in "Cook's Voyage" above cited. In the following year (1818) the same species received from Lichtenstein (*op. cit.* p. 1592, no. 4, Taf. 19) the name *Onychoteuthis bergii*. Lichenstein's figure is copied by Férussac and d'Orbigny in their 'Histoire Naturelle des Céphalopodes,' 4to, 1835–1848, "G. *Onychoteuthis*, pl. v."

[3] Catalogue of the Mollusca in the Collection of the British Museum, Part I. *Cephalopoda Antepedia*, by John Edward Gray, 12mo, 1849, p. 46 *et seq.*

[4] "When these latter suckers are applied to one another, the tentacles are firmly locked together at that part, and the united strength of both can be applied to drag toward the mouth any resisting object which has been grappled by the terminal hooks. There is no mechanical contrivance which surpasses this structure: art has remotely imitated it in the fabrication of the obstetrical forceps, in which either blade can be used separately, or, by the interlocking of a temporary joint, be made to act in combination."—*Cycl. of Anat.* vol. i. 1836, p. 529, fig. 215.

In *Onychoteuthis banksii* the dorsal surface of the head shows a few short longitudinal ridges not present in *O. raptor*, and the arms shorten in the order 4, 3, 2, 1. The tentacular hooks are also more numerous than in *O. raptor*; and the tentacles themselves are relatively more slender.

A mesial longitudinal section of the mantle and some further dissection exposed the following parts (Pl. XXIX. fig. 2):—

The infundibulum has on each side of its base an elongate narrow cartilaginous cavity, *a*, which articulates with a prominence of corresponding shape, *b*, from the inner surface of the opposed side of the mantle. Near the apex of the funnel lay the "valve," *c*, of a semicircular shape. At the base of the funnel opens the vent, *d*; the anal end of the rectum supports a pair of filamentary appendages, *e*, *e*. The duct of the "ink-bag," *g*, terminates just within the anal verge. At the base of the gills, *h*, *h*, are the branchial hearts, *i*, *i*, each with a small fleshy appendage, *k*. A portion of the systemic heart is exposed at *m*. Portions of the "musculi retractores infundibuli" are shown at *n*.

The specimen was a female, and probably young. The long narrow ovary, *o*, not developed as at the sexual period, occupies the narrow pointed fundus of the abdominal cavity. Seemingly single outwardly, its inner capsule forms a mesial septum, indicative of the parial character. From each moiety is continued an oviduct, *p*, which, after some convolutions, terminates in an enlarged outlet, the thick soft lining membrane of which is disposed in folds radiating from the central aperture, *q*. The nidamental glands, *r*, are a pair of elongate bodies situated between the oviductal outlets, beyond which the narrower end of the accessory glands extends forward between the branchial hearts.

The digestive organs being removed, are shown in Pl. XXIX. fig. 3. A long, slender œsophagus, *a*, is continued, as in other Decapods, without ingluvial dilatation, to the stomach, *b*. This is large, oblong, with thinner parietes than in the cancrivorous Octopods, but with the muscular fibres radiating from centres on opposite sides of the bag. The pylorus is a slit with tumid borders, and communicates with a second cavity, *c*, into which open the hepatic ducts, conveying the bile, and also the secretion, probably pancreatic, of the clustered follicles *d d*, developed upon and from the ducts of the liver. The intestine is continued with a slight bend straight to the tentaculate vent, *f*. The liver appears to be a single elongated gland with a glistening longitudinally fibrous capsule, *g*. On removing this a delicate inner layer seemed to form a septum, indicative of a bilobate condition. The cæcal ends of the constituent lobules are shown in the moiety *h*, from which the fibrous capsule has been removed. The large elongate ink-bag, subbifid at its base, is shown at *i*; its duct is short.

The branchial lamellæ are marked *a*, fig. 4; the suspensory ligaments are shown at *b*; the systemic veins, with their appended follicles, at *c*, *c*; the branchial hearts and their appendix, at *d*, *d*; the branchial arteries, at *e*, *e*; the branchial veins, at *f*, *f*; the systemic heart, of a rhomboidal or lozenge shape, with its two aortæ, ascending and descending, is shown at *g*.

The mandibular, radular, and salivary organs are almost in miniature what is shown in the same apparatus of the large Cephalopod next to be described, and justify the reference of the Hunterian specimen no. 308 to the following genus and species :—

Genus Enoploteuthis, d'Orb.[1]

Species Enoploteuthis Cookii, Ow.

The beak (Pl. XXX. figs. 1, 2, 3) consists, as in all Cephalopods, of an upper (fig. 1) and a lower (fig. 3) mandible; and, as in all the Dibranchiate kinds, the hardest part does not exceed the density of horn. In each mandible may be distinguished an anterior exposed, or "rostral" part (*a b e f*), and a posterior concealed part (*d g*), which, as affording attachment to the biting-muscles, may be termed "apophysial." This is the part in which the corneous density degenerates into a kind of gristly flexible tissue.

As in all Cephalopods, the lower mandible receives the upper when the beak is closed.

The rostral part of the upper mandible (fig. 1) sends forward a long, somewhat slender, decurved, sharp-pointed "uncus," *a*, 11 lines (=23 millims.) in length at the lower border, as defined by the "ala." This part, *b*, descends vertically with a feebly convex anterior border to apply itself to the inner surface of the corresponding part of the lower mandible (fig. 3, *f*). The upper border of the "uncus" is continued backward, in a convex curve, 3 inches from the apex. The hind border, *c*, of the rostrum has an extent in a straight line of $2\frac{1}{2}$ inches; it describes a sigmoid curve concave forward in the upper three fourths, convex below, both curves feeble. The "apophysis," *d*, *d*, is continued $3\frac{1}{4}$ inches behind the rostrum. Its upper part begins 9 lines (=20 millims.) below the hind and upper apex of the rostrum; the lower border quits the rostrum much nearer the lower apex of the ala, *b*. Much of the interior border of the apophysis becomes free very near the hind border of the rostrum, *c*, leaving a long but shallow groove for the tendinous insertion of the supramandibular muscle; but a ridge-like extension continues the under or oral surface of the rostrum backwards, forming a horny roof of the fore part of the mouth, the extent of which is shown in the vertical section given in fig. 1, Pl. XXXI. The apophysial plate expands vertically as it retrogrades to its mid extent, Pl. XXX. fig. 1, *d*, *d*, where the vertical diameter is $2\frac{1}{2}$ inches; it then contracts, describing a sigmoid curve to the upper apex. The whole length, in a straight line, of the upper mandible is $4\frac{3}{4}$ inches. The extent of the hinder cartilaginous border is from 2 to 3 lines, as indicated by the dotted outline in fig. 1.

The lower mandible (ib. fig. 3) has a smaller apophysis and a shorter but deeper and rather less sharply pointed uncus, *e* (Pl. XXX. figs. 2 & 3). From the base of the uncus is continued a broad ala, *f*, overlapping the corresponding part, *b*, of the upper

[1] Histoire Naturelle des Céphalopodes Acétabulifères, p. 336.

mandible. The apophysis is strengthened on each side by a broad ridge or rising, *g*, extending longitudinally to the terminal apex.

The muscular masses inserted into the mandibular apophyses are of a very dense tissue. The hinder fascicles open, the fore ones close, the beak. The outer and inner plates of the lower uncus recede in a less degree than those of the upper one; both are occupied by the condensed or tendinous modification of the mandibular muscular mass.

A thick fleshy inner lip, fig. 2, *h*, of a circular or sphincteric shape, immediately surrounds or invests the mandibles: it is reflected from the base of the rostral part of the upper mandible at a greater distance (about double) than from that of the lower mandible (as shown in the section fig. 1, Pl. XXXI). The free anterior border of this lip is coarsely notched or divided into lobes, answering to the finer and more numerous marginal plicæ present there in most of the smaller forms of Dibranchiates. The outer lip is attached by eight frœna radiating from the outer side of the inner lip to the bases of the eight ordinary arms. Each frœnum sends off from the middle of its free margin a process which is fimbriate (Pl. XXXI. fig. 1, *i*, *i*), but does not develop any suckers.

The lingual apparatus consists of the tongue proper and the rasp or "radule;" to which are added a pair of "faucial folds" bearing on their inner surface small but distinctly visible horny denticles. The tongue proper (ib. fig. 1, *j*) is partially divided into two lobes, into the contracted base of which is inserted a slender "retractor linguæ" muscle, *f*. The "radule," *k*, encasing the third lobe of the lingual apparatus with its horny plate, bears on the upper and fore part thereof seven longitudinal rows of fine recurved spines. The faucial folds, *l*, *l*, are continued from the sides of the base of the radular lobe and from the covering of the lingual salivary glands, *m*, as far back as the beginning of the œsophagus, *n*. Each fold is $2\frac{1}{2}$ inches in length, and 7 lines in breadth at the dentigerous part, behind which they gradually narrow to their œsophageal termination. The horny armature is on the inner surface of the broader anterior portions of the folds; the spinules are slightly recurved, and affect, though less regularly than on the radule, a longitudinal disposition.

The lingual salivary glands are compressed, parial, in close contact. Their vertical extent is about one third of their length. They are convex and thick posteriorly, *m*, becoming flattened and contracting as they advance to send off each their duct, which opens into the cleft between the faucial fold and radule (as indicated by the bristles).

The œsophagus, *n*, has a thick muscular and longitudinally plicate epithelial tunic; the diameter of the contracted tube is half an inch[1].

The systemic ventricle (Prep. no. 963, Hunterian Physiological Series; Pl. XXXII. fig. 6) presents the same rhomboidal figure is in *Onychoteuthis raptor* (Pl. XXIX. fig. 4, *g*), with a similar relative position of the valvular terminations of the branchial

[1] A reduced cut of the subject of fig. 1 is given (fig. 225), and a general notice without details, in p. 621 of my 'Lectures on the Comparative Anatomy and Physiology of the Invertebrate Animals,' 8vo, 1855.

veins, and valvular beginnings of the two aortæ[1]. The proportionate size of the ventricle is the same which the mandibles bear to those in *Onychoteuthis raptor*.

There seems no reasonable doubt, therefore, that we have in the subject of figure 6, Pl. XXXII. the chief part of the organs of circulation in Cook's "great hook-armed Cuttle-fish." The muscular part of this heart is thickest at its widest part, near the entry of the branchial veins, *a*, *a*, and gradually thins off to the fore and hind ends where the aortæ, *b*, *b'*, are sent off. The fasciculi of fibres are disposed in different planes, and decussate each other obliquely. The terminal aperture of each branchial vein is provided with a pair of semilunar valves, *c*. The origin of each aorta is guarded by two similar but smaller valves. The right branchial vein terminates on a plane anterior to the left, and slightly affects the regularity of the lozenge-shape of the heart.

I have reserved the most obvious and certain evidences of the genus and present rare and huge species to close such account of *Enoploteuthis cookii* as can now be contributed to the Cephalopodal chapter of Zoology.

Fortunately part of one of the ordinary eight arms (Pl. XXXII. fig. 1) was rescued from the cooking-galley of the 'Endeavour,' and, with the few viscera above described, was put into spirits for the anatomist at home. A section has been taken, probably by Hunter, from the base of the portion transmitted. The circumference of this section (ib. fig. 3) is $4\frac{1}{2}$ inches. The transverse section fig. 2 gives the form and diameters of the present truncate end of the portion of arm fig. 1. The arm is somewhat compressed, ovate, narrowest where it supports the uncinate acetabula, *a*, *a*. Its substance is mainly muscular. The integument is smooth and thin; there is no trace of ridge, duplicature, or production at either the line of the dorsal or of the acetabular surfaces, such as are seen in the vela of *Ommastrephes ensifer*. Both sections show the subcentral cavity, *b*, for lodging the bloodvessels and a nerve; a much smaller cavity, *c*, near the interspace of the acetabula appeared to lodge a nerve only. The muscular fibres are mainly in two groups; the mass of the external longitudinal ones, *d*, is, in section, thickest at the acetabuliferous part, and gradually decreases to the opposite and larger end of the section. The transverse or radiating fibres, *e*, pass from the thin aponeurotic line, *f*, dividing their mass from that of the longitudinal ones, *d*, to the stronger aponeurotic wall, *g*, of the subcentral nervo-vascular canal; the fibres of a well-marked fasciculus, *g*, act more especially upon the acetabuliferous part of the arm, tending to retract it, and to strengthen or support the hooks when these are infixed in a prey and when they are acted upon by the flexor and other muscular fascicles working the movements and applications of the entire arm. The central two thirds of the general muscular mass is condensed, seemingly by a greater admixture of tendino-fibrous tissue than in the peripheral third: it suggests the idea of a flexible supporting or skeletal part of the arm.

[1] This was the ground of my determination of no. 903, in the 'Catalogue' above quoted, p. 84.

The acetabula are uncinated and of similar structure to each other, differing in little else save size, which diminishes as they are situated nearer the free extremity of the arm. Their number in the portion preserved (Pl. XXXII. figs. 1 & 3) is fifty, of which four have been lost, as shown in fig. 1. They are arranged in a double alternate series, in proportional numbers and at nearly proportional distances throughout. This arrangement, with the size and shape of the hooks, shows that we have not here the acetabuliferous extremity of one of the pair of "tentacles," as in *Onychoteuthis raptor* (Pl. XXIX. figs. 1 & 2, *t*).

Each acetabulum, in *Enoploteuthis cookii*, consists of a "pedicle," *a* (figs. 4, 5), a cup, *b*, with a horny circular lining, *c*, produced into the hook, *d*. The pedicle is conical, $\frac{1}{10}$ of an inch (=3 millims.) in length in the larger acetabula; its apex is inserted, not into the pole, or middle of the base, of the cup, but nearer that side toward which the hook is bent, which in most cases is toward the base of the arm.

The fleshy cup has the form of an irregular, rounded, hollow, truncate cone, of which the base is somewhat concave; and the cavity, excavated for the lodgment of the annular basis of the hook, leaves an apical aperture for the protrusion of the uncinate portion. The hook is developed, in reference to the sides and the fore end of the supporting arm, from the outer and fore part of the border of the horny hoop.

Now, here it may be remembered that the homologous hoop or partial horny lining of the sucking-cup in all Decapods is commonly more or less denticulate at its free border, usually minutely so. In many Squids the spines gradually gain length at the outer part of the hoop's margin (*Loligo plei*, Bl., for example [1]). The development is proportionally greater in *Loligo brongniartii*, Bl.[2]. In *Ommastrephes ensifer* (Pl. XXVIII. fig. 2) the partial development is restricted to fewer spines, but is greater. In *Loligopsis guttata* four of the spines at the outer side of the armed border of the hoop in the tentacular suckers are much longer than the rest. In *Enoploteuthis cookii* the development is concentrated on one part of the hoop, but is excessive, forming the characteristic claw of the genus.

The base of this hook is so extended as to seem to expand into the horny lining of the acetabulum, in the flesh of which it sinks. This lining, soft and whitish at its inserted border, becomes corneous (or chitinous) and thickens as it rises above the brim of the fleshy cup to form the hook. Of the fleshy or muscular mass the fibres (fig. 4 *a*, fig. 5 *a*, *g*) exterior to the horny ring are circularly disposed, adapted to compress the base of the hook and protrude it. The central fibres (ib. *f*) are longitudinal, and converge to be inserted into the hollow base of the hook for its retraction. This action is analogous to that by which the ordinary Cephalopods create the vacuum of the sucking-cup in the act of adhering to and seizing their prey; but in *Enoploteuthis* the base of the hook extends too far into the substance of the acetabulum to allow of such retraction, while

[1] D'Orbigny, op. cit. *Loligo*, pl. xxiv. figs. 17, 18.

[2] Ibid. *Loligo*, pl. iv. figs. *c* & *d*.

the production of the hook prevents the application of the soft unlined free margin of the cup; the free surface continued into the cavity is subplicate.

Figure 4 (Pl. XXXII.) shows a vertical section, in the line of curvature, of the hook and its supporting cup, with a subjacent part of the arm. In the enlarged outline of part of this section (ib. fig. 4, *a*) are shown:—*a*, the pedicle; *b*, the acetabulum; *c*, its cavity lined by the circular base of the hook, *d*; *e*, the fleshy cushion which rises into the hook's basal cavity; *f*, the longitudinal fibres which retract the cushion and hook; and, *g*, the circular fibres which protrude the cushion and hook.

Figure 5 is of a vertical section of the posterior or convex part of the hook and acetabulum, showing the depth to which the hoop or base of the hook extends into the fleshy mass of the acetabulum. In *Enoploteuthis* the walls of the cup are the thickest, and the cavity is the smallest, in the Cephalopodous class.

Of the dried end of the body of Cook's large Cephalopod in the Hunterian Museum (now no. E. 1066), which in 1830 I inferred to have been part of that captured during the great navigator's "First Voyage," I submit three drawings of the natural size (reduced in Pl. XXXI.), one of which, fig. 4, is rather a diagram of the end amputated, which is at the fore part of the origin of the pair of terminal rhomboidal fins. Notwithstanding the degree of shrinking which this tegumentary and muscular mass has undergone in the process of desiccation, the total length of this portion is 1 foot $5\frac{3}{4}$ inches; the extreme breadth between the fins is $6\frac{2}{3}$ inches. The fins, of thinner substance than the mantle, have undergone more loss of shape from drying; but, though shrivelled and crumpled, they manifest the rhomboidal form common to the rest of the genus.

In *Enoploteuthis cookii* the fins attain their greatest breadth about one fifth of their length from the fore end of their base, gradually narrowing from the angle so formed to the end, or very near to the end, of the obtusely pointed termination of the body. Their line of attachment extends along the dorsal side of the body (Pl. XXXI. fig. 3)—at first within an inch or two from the lateral contour, but gradually nearing the sides as they descend and contract to their terminal subsidence. Fig. 2 (ib.) shows the ventral surface of the dried specimen; figure 4, the amputated end.

I find no described or figured species of *Enoploteuthis* which presents this form of the terminal fins. The nearest approach to it is made by the *Enoploteuthis armata*, Quoy[1]; but the angles at the outer margins of the fins project, as in *Onychoteuthis raptor*, halfway toward the pointed end of the pair. In *Enoploteuthis leptura*, Leach[2], each fin has a right-angled triangular figure, and they do not extend to the end of the body. In *Enoploteuthis lesueurii*, d'Orb.[3], the base of each rectangular fin commences, as in *Sepioteuthis*, at the fore end of the body, but terminates some way anterior to the pointed hind end.

[1] D'Orb. *op. cit.* p. 340, *Onychoteuthis*, pl. ix. figs. 2 & 3.

[2] *Op. cit.* p. 337, *Onychoteuthis*, pl. ii. fig 4, pl. xi. figs. 6–14.

[3] *Op. cit.* p. 339, *Onychoteuthis*, pl. xi. figs. 1–5.

I estimate the combined breadth of the terminal fins in *Enoploteuthis cookii* when recent, taken at the outer angles, to have been not less than 1 foot 4 inches.

In the desiccation of the body-skin the transverse arrangement of the superficial muscular fasciculi is indicated; the thinner and more yielding ventral wall is shown by the median longitudinal infolding of that part in the process of drying.

Considering that so much of the fleshy part of the great hooked Squid was cooked as to serve the appetites of at least three, and perhaps four, of those at table in the Commander's cabin, I infer that a goodly proportion of the body anterior to the fins went to the culinary galley, and that the basal attachments of the fins did not extend, as in *Enoploteuthis lesueurii*, to the fore margin of the mantle.

On the supposition that the proportion in advance of the fins was that which is shown in *Onychoteuthis raptor* (Pl. XXIX. fig. I), one may set down the length of the body of *Enoploteuthis cookii* at 3 feet. The length of the head to the setting-on of the arms would be, according to the same proportions, about 10 inches; and the length of the longest arm might be 15 inches, of which the terminal half may have been cut off for Hunter's collection. If the outstretched tentacles were each as long as the body, 3 feet may be added to the combined length of head and body to give an approximate idea or estimate of the total length of the Cephalopod in question, viz. 6 feet 9 inches. I have ventured on a reduced restoration in fig. 1, Pl. XXXIII.

In a work on the Natural History of Chili, of which the second edition appeared in 1810, the author, on the authority apparently of the latitude and longitude assigned by Lieut. Cook to the place of capture of his great hook-armed Cuttlefish, includes it in the Chilian fauna; but, as he adds nothing to the quotation from Hawkesworth's account of the voyage (*anteà*, p. 146), I conclude that he had not received or seen a second specimen of this remarkable species. All that is given relative thereto in Molina's work is, verbatim, as follows:—

"Oltre alla Seppia officinale si ritrovano nel mare Chilese tre altre specie di Seppie assai singolari. La prima è la *Seppia unguiculata*, la quale è di gran mole, ed ha in luogo di succhiatori le brachia, o siano i due lunghi tentacoli armati da un doppio ordine di artigli o unghie acute simili a quelle del gatto, che si ritirano, come esse, in una sorta di fodero. Questa specie è di un gusto delicato, ma non è molto comune in quel mare, dove fu osservata dal cel. Banck nel primo viaggio del Cap. Cook."—*Saggio sulla Storia Naturale del Chili, di* Gio. Ignazio Molina, seconda edizione, 4to, Bologna, p. 175 (1810).

M. d'Orbigny, referring to the above work, merely observes, with regard to the *nomen specificum*, that the term "*unguiculata*" is objectionable, seeing that it is a character common to the genus, in fact the essential character of the section *Enoploteuthis*. But as to his proposition to substitute the name of the Italian compiler, I think Cephalopodists will agree that in common justice the honoured name of the original describer should be attached thereto. Dr. Leach desired to do honour to the captor of

the great Squid when he applied the name "Banksii" to a small African hook-armed species, which, in 1817, he deemed identical with the larger one of the Pacific Ocean. M. d'Orbigny limits his notice of this truly remarkable Cephalopod to the following passage:—"On ne connaît de cette espèce qu'une partie d'un bras sessile gigantesque, couvert de crochets sur toute sa longueur. Ce caractère étant celui des *Enoploteuthis*, je l'ai placé dans ce genre. Je dois à l'obligeance de M. Richard Owen un beau dessin de ce bras déposé au Musée du Collége des Chirurgiens de Londres."—*Op. cit.* p. 339 (1848). The drawing was a copy of that (Pl. XXXII. fig. 1) which accompanies the present paper. My esteemed correspondent and fellow-labourer made no use of it for his great work.

Cephalopods remarkable for large Size.

Genus PLECTOTEUTHIS[1], Owen.

Species PLECTOTEUTHIS GRANDIS, Owen.

It has been shown (p. 144) that the side of the arm opposite the acetabuliferous tract is longitudinally and mesially ridged, and there more or less produced, in certain Squids (Loliginidæ); but in the British Museum is preserved one of the eight ordinary arms of a Cephalopod which, from the characters of the cups (Pl. XXXV. fig. 2), is referable to the genus *Ommastrephes*, d'Orb., but which supports them on a relatively broader flattened tract (ib. ib. *a*), and presents on the opposite or dorsal side (Pl. XXXIV. fig. 2) a similar flattened tract, *a*, from each margin of which a fold of the integument, *b*, is produced, of varying breadth. A transverse section of the arm consequently gives a quadrate instead of triangular form, in this respect repeating the character shown in *Loligopsis ocellata*.

The cups or suckers are arranged in a double alternate row along their tract, the margins of which are produced into a well-defined fold or thin seam (Pl. XXXV. fig. 2, *c*, *c*), but of minor breadth than the dorsal folds. This plicatile condition of the ordinary arms has suggested the generic name.

The length of this arm, which has been amputated at or near its base, is not less than 9 feet; the diameter of the amputated base from within outwards is 4 inches; the same from side to side is 3 inches; the total circumference is 1 foot. At this basal part of the arm (Pl. XXXV. fig. 1) the acetabula have not begun to be developed; it would seem to correspond to the non-acetabular tract extending, in most Loliginidæ, a short way from the outer lip. Here, in *Plectoteuthis*, the folds are restricted to the dorsal pair (ib. fig. 1, *b*, *b*), but they do not exceed an inch in breadth. The opposite surface, *a*, *a*, is convex across: this convexity broadens into flatness as the arm extends and begins to develop its cups. The circumference, taken midway between the two ends of the arm, is 9 inches. The breadth of the acetabuliferous tract at 6 inches from the amputated end is $5\frac{1}{2}$ inches with the marginal folds outstretched; the interspaces

[1] Gr. πλεκτὸς, folded, τευθὶς, Squid.

between a pair of suckers, taken at the basal attachment of their peduncles, is 2 inches, where they are widest apart. The greatest width of the acetabuliferous tract within the marginal folds is $3\frac{1}{2}$ inches.

The section of the basal part of the arm shows the muscular mass to be divided by a thin aponeurosis (Pl. XXXV. fig. 1, *d*) into a peripheral (*e*) and a central (*f*) portion. The peripheral muscular mass, *e*, at the inner side, *a*, shows a thickness of 6 lines; it is traversed by the main artery of the arm, *g*. This part of the peripheral mass gradually diminishes on each side to a thickness of 2 lines, and then as gradually increases to 4 lines at *e'*; when, bending in to the outer side of the arm, it thins off to half a line, the aponeurotic boundary coming there almost into contact with the outer integument. The transverse diameter of the inner muscular mass at the dorsal third is 2 inches 8 lines; at the ventral third it is 2 inches: and here the section shows the nerve, *h*, in a canal of 5 lines diameter, the nerve being surrounded by loose cellular tissue including venous channels.

The cups gradually increase in size to the sixth or eighth, which has a diameter of three fourths of an inch; and here the acetabuliferous tract and its marginal folds show the dimensions given in fig. 2, Pl. XXXV. They begin very gradually to diminish beyond the basal ten or twelve inches of the arm.

Of the large cups the peduncle is 7 to 8 millims. in length; its base is 5 millims. in breadth, and gradually contracts to 2 millims. before insertion. This is at the side of the base of the cup, where the cup is least deep; and here there is a depression for receiving the peduncle (Pl. XXXV. fig. 3).

The base of the cup is 20 millims. in diameter; it is slightly convex, shows a fleshy tint, which changes to a white aponeurotic appearance at the periphery; and this character of the exterior of the cup continues to the aperture, which is circular and 10 millims. in diameter. From this aperture slightly projects the margin of the broad chitinous hoop lining the walls of the cavity. The bottom of the cup, 12 millims. in diameter, is soft, muscular, covered by a thin, transparent aponeurosis, and seems, by its size, to have been capable of assuming the shape requisite to act as a kind of piston, and by the vacuum so produced to cause outward pressure to aid in infixing the teeth of the denticulate free border into the surface to which the arm may have been applied.

The suckers, as they extend along the arm, diminish in diameter in a greater degree than in depth, and the smaller acetabula make a nearer approach to the spheroid form (Pl. XXXIV. fig. 2); but each hangs by a proportionately long peduncle until they come to near the end of the series, where they show but 1 millim. diameter, passing out of sight at about 2 inches from the pointed termination of the there gradually attenuated arm. The basal cups of the same side or series occur at first at intervals of 24 millims.; and as the longitudinal interval shortens, the transverse one increases to an extreme of 2 inches, then progressively diminishes with the diminishing size of the arm.

The integument of the acetabuliferous tract shows a denser surface and paler tint

than that covering the rest of the arm; the breadth of the marginal fold along the basal 12 inches of the arm (Pl. XXXV. fig. 2, *e*) is about 20 millims. The surface of the fold towards the non-acetabuliferous part of the arm shows the same deep colour as that part. The opposite surface of the fold continued from the acetabuliferous tract has the paler tint of that tract. The contrast was doubtless greater in the living Squid, when the pigment was in lively motion along the free surface.

In the interspace of two cups of the same side the integument shows two low folds or risings, produced by a pair of muscular bundles detached from the mid-acetabuliferous space to the edge of the ectacetabular fold, for the contraction or narrowing of that fold. Each dorso-marginal fold (Pl. XXXIV. fig. 1, *b*, *b*) shows a breadth of about 2 inches as far as where it extends along the middle third of the length of the arm; thence the breadth gradually decreases; and the folds finally subside about 4 inches from the end of the arm (ib. fig. 2).

The total length of the above-described cephalic arm (one of the ordinary eight) is, I may repeat, 9 feet; its circumference at mid-length, folds inclusive, is 9 inches; the number of acetabula which it supports is not less than two hundred and ninety-two.

The known species of the Loliginidæ vary in the relative length of the arms to the body. In *Loligo vulgaris*, Lam.[1], the length of the longest is about one half of the body, measured from the end of the anterior prominence of the dorsal margin to the posterior apex of the mantle. In *Ommastrephes duvaucellii*, d'Orb.[2], the length of the same arm is four fifths that of the body or trunk similarly measured. In *Loligo todarus*[3] the length of the same arm is equal to five sixths that of the body. According to the latter standard the length of the body of our *Plectoteuthis* may be estimated at 10 feet 6 inches, according to the first standard at 18 feet. In both estimates the length of the head, or part intervening between the trunk and origin of the arms, must be added; it is commonly one third the length of the trunk. If this be taken at 18 feet, the total length of *Plectoteuthis grandis* may have been 33 feet.

The above-described material evidence of the huge dimensions attained by certain species of Cephalopoda has long formed part of the stores in the British Museum; and there is no note or record of its origin[4]. I proceed, therefore, next to notice similar large specimens of which the localities are known.

Of these a satisfactory and instructive instance is the following:—In the general observations on the fauna of the isles of St. Paul and Amsterdam by the accomplished zoological member of the French expedition of the "Transit of Venus" (9th December, 1874), M. Ch. Vélain states that "at the early part of November in that year a tidal wave stranded on the north shore of the Isle of St. Paul a Teuthid of the group of

[1] D'Orbigny, op. cit. *Loligo*, pl. 22; the arms are somewhat shorter relatively in the Squid figured as *L. vulgaris* in pl. 8. [2] Op. cit. *Loligo*, pl. 14. [3] Op. cit. *Loligo*, pl. 1.

[4] It is briefly referred to by Mr. W. Saville Kent, F.L.S., in the 'Proceedings of the Zoological Society,' March 1874, p. 179.

Ommastrephes, which measured not less than 22 feet $10\frac{1}{2}$ inches in length from the end of the body to that of the tentacles"[1].

In a subsequent account[2] M. Vélain notes in this locality two species of Squid (*Ommastrephes*) which are seen to dart, like arrows, from the surface of the sea, and afford food to the penguins (*Eudyptes chrysolopha*); also a small Poulpe, taken in the sea which occupies the crater, and which is referred to *Octopus vulgaris*. This is captured by the fishermen of the island for bait; and the same men testified to the apparition nearly every year of a gigantic Cephalopod. Fortunately, on the 2nd of November, 1874, one of these molluscous giants was cast by unusual storm-waves upon the northern beach of the island, and became the subject, as it lay, of the photographer of the expedition, M. Cazin. The photograph is copied in the plate, fig. 8, given on p. 81 of M. Vélain's "Observations" in the undercited volume of the 'Archives de Zoologie,' and forms the subject of the cut, fig. 3.

Fig. 3.

Of this large Cephalopod the acetabula are said to be provided "with a corneous hoop, finely denticulated," on which character, and their disposition upon the arms,

[1] "Dans les premiers jours de Novembre, un raz de marée à jeté sur la chaussée du nord un Calmar du groupe des *Ommastrephes*, qui ne mesurait pas moins de $7^{m}{\cdot}15$, de l'extrémité du cornet à celle des bras tentaculaires."—"*Observations effectuées à l'île de Saint Paul*," *Comptes Rendus des Séances de l'Académie des Sciences*, t. lxxx. 1875, p. 998.

[2] "Observations générales sur la Faune des deux îles, suivies d'une description des Mollusques," Archives de Zoologie Expérimentale et Générale, by H. de Lacaze-Duthiers, 8vo, tome xvi., 1877, p. 1.

M. Vélain was led, in his brief notice to the Academy of Sciences, to refer the huge specimen to Steenstrup's genus *Architeuthis*. But in the later notice he specifies the singularly truncate character of the arms, which do not narrow to a point as in all other Cephalopods; he refers also to a totally different hinder termination of the "gladius." This, however, is not shown in the photograph of the entire animal; nor is the kind of difference specified. But, on the ground below cited[1], the author proposes to refer his subject to a distinct genus, "*Mouchezis*," in honour of the commandant (Monchez) of the expedition.

Of this specimen one of the tentacles, the beak, and pharynx were exhibited to the Academy of Sciences; and those parts are doubtless preserved in the Museum of Natural History, Jardin des Plantes.

If the stunted terminations of the ordinary cephalic arms of *Mouchezis* be accidental to the individual specimen, the characters of the brachial acetabula, both as to structure and arrangement, conform with those of the arm of the great Squid (*Plectoteuthis grandis*) above described. Of the existence of folds of skin extending from the margins of the acetabuliferous tract or the opposite parts of the arm of *Mouchezis*, no mention is made.

What is remarkable in the tentacular pair is their great length, almost equalling that, relatively, in *Loligopsis veranii*[2]. The prolonged attenuation of the pointed end of the body approaches to that character in *Loligo subulata*, Lam.[3]; but it may be remarked that the corresponding end of the gladius in that species is not drawn out to the same degree.

Assuming a cephalic arm of *Mouchezis* to have been one fourth the length of the extended tentacle, which is estimated at 16 feet, such arm would be less than half the length of the great Ommastrephic arm in the British Museum.

The total length of *Mouchezis*, from the tip of the outstretched tentacle to the pointed end of the body, is set down as nearly 23 feet, leaving 8 feet for the length of the body. If, therefore, the tentacles of *Plectoteuthis* bore like proportions to those of *Mouchezis*, the total length of that Cephalopod must have greatly surpassed the Teuthid of the Isle of St. Paul[4].

[1] "Ses dimensions, ses venteuses circulaires, garnies d'un cercle corné finement denticulé, leur disposition sur les bras, semblait motiver ce rapprochement, mais certains autres caractères l'en éloignent; en particulier la forme singulièrement écourtée des bras, qui paraissent tronqués brusquement au lieu de terminer en une pointe effilée, comme dans tous les Céphalopodes, ainsi que la terminaison inférieure, toute différente, de l'osselet dorsal."—*Op. cit.* p. 83.

[2] D'Orbigny, op. cit. *Loligopsis*, pl. 2. fig. 1.

[3] Id. ib. *Loligo*, pl. 17. figs. 1 & 2.

[4] The above comparisons imply confidence in the accuracy of the dimension 7·15 m. assigned to *Mouchezis*. It would be acceptable to Cephalopodists if figures of the natural size of the parts of the mouth preserved, corresponding with those (Pls. XXX. & XXXII.) of Cook's Hooked Squid, were published. Figures, nat. size, of one of the cephalic arms and of the acetabular expansion of the tentacle of *Mouchezis* would be equally welcome.

The locality I next proceed to notice in connexion with Cephalopods of unusual size is the North Atlantic. For the first of these instances I am indebted to the Rev. M. Harvey, of St. John's, Newfoundland, who transmitted two photographs of parts of a specimen with the following notes of its capture:—

"A few weeks ago" (December 1873) "two fishermen lying off St John's observed an object floating in the water which they took to be a portion of a wreck. On reaching it one of the men struck it with the boat-hook, whereupon the supposed piece of wreck became alarmingly lively, 'rearing a parrot-like beak as big as a six-gallon keg,' with which it smote the boat. Next it 'shot out from its head two huge livid arms, and began to twine them about the boat.' Happily an axe lay handy, and with it the boatman, recovering from the surprise into which this unexpected attack had thrown himself and his mate, cut off both the arms as they lay over the gunwale, whereupon the fish backed off and ejected an immense quantity of inky fluid that darkened the water for a great distance about."

In the above account, published with photograph no. 2 (Pl. XXXIII. fig. 2), the passages quoted are verbatim testimonies of the boatmen, and bespeak, besides their emotions, the known characteristics of a Cephalopod, viz. the parrot-like beak, the protrusile tentacles, and the emission of the defensive ink.

Tentacles of 18 feet would easily stretch across or even clasp an ordinary fishing-boat. The beak, "as big as a six-gallon keg," wielded by an animal "60 feet in length and 5 feet in diameter, with a tail 10 feet across, as observed in the air," may be relegated to the region of fable, from which the prosaic naturalist is forbidden to adorn his descriptions.

The photograph no. 1 is of the head, arms, and tentacles of a Decapod differing from *Sepia*, and resembling *Sepioteuthis*, *Loligo*, *Loligopsis*, *Ommastrephes*, and *Onychoteuthis*, in having the acetabula in two alternate rows on each arm. It differs from *Onychoteuthis* in having the suckers of the tentacles as well as of the arms not provided with hooks. In this photograph five of the cephalic arms are shown with more or less of the acetabular surface exposed; and there seems to be some difference in their relative length; but this cannot be precisely determined and applied to the homologues of the arms, 1–4, as, for example, in *Ommastrephes ensifer* (Pl. XXVIII. fig. 1). There is no indication of *vela* or of membranous extensions of the arms, as in that species and in *Plectoteuthis*.

The terminal acetabuliferous expansion of the tentacles in photograph no. 2 (Pl. XXXIII. fig. 2) supports along the three middle fifths two alternating series of large suckers; an indeterminate number of irregularly disposed smaller ones are pretty closely scattered over the proximal and terminal fifths of the expansion; a few small suckers are added in a single row along each border of the double row of large ones. The acetabular expansion of the tentacle is gradual, and does not exceed at its broadest part more than two diameters of the supporting stem. The length of the expansion is

eleven times its greatest breadth; the number of the larger suckers is twenty-four, twelve in each row, on each tentacle. The terminal fifth of the expansion gradually attenuates to a point.

In the above characters the following species, *Ommastrephes sagittatus*, d'Orb.[1], resembles the great Newfoundland Squid, but differs in the larger relative size and smaller number of the proximal group of the smaller tentacular acetabula. The larger acetabula, moreover, are only eight in each row; and these rows are closer together. There is no trace, in any of the species figured, of the oblique ridges which divide the alternating pairs of the larger tentacular suckers, which ridges, in the Newfoundland Squid, are continued from those that define the shallow depressions from which the large suckers severally project; these seem to be sessile or to have very short peduncles. The above characters, well shown in the photograph, I have not found figured or described in any other species of *Ommastrephes*.

In the letter from the Rev. M. Harvey, of St. John's, Newfoundland, accompanying the photographs, "the eight shorter arms are" [stated to be] "each 6 feet in length and 10 inches in circumference at the junction with the central mass." They are also said to "taper to a fine point," to be "all armed with denticulated suckers,—in all eleven hundred in the ten arms." The tentacles are stated to be "each 24 feet in length, with suckers at the ends." "The eyes measured about 4 inches in diameter."

These particulars are also given in the Rev. Mr. Harvey's letter to the London Stereoscopic Company, which is published with the photographs; and with respect to the subject of no. 2 he states:—"This large arm, cut off by the fishermen in Conception Bay, measures 19 feet in length." This is, I conclude, the proportion of the 24 feet previously allotted to the tentacle when entire. But in the note attached to photograph no. 2 Mr. Harvey states:—"The entire length was *thirty-five* feet, 10 feet being left attached to the body and 6 feet having been destroyed." But this would seem to be given from the report of the boatmen. "The broadened extremity" (of the tentacle) "is armed with one hundred and sixty sucking-disks, about $1\frac{1}{4}$ inch in diameter." In this enumeration the small and large suckers are counted together, and no notice is taken of the well-marked difference of size between the twenty-four suckers in the two alternate rows of twelve each, and the intercalated smaller suckers, together with the proximal and distal groups of still smaller ones, which are shown in both the photographs.

It is probable that the diameter or breadth of the sucker relates to one of the larger series.

In a paper by Mr. A. Verrill "On the Cephalopods of the North-eastern Coast of America"[2] a brief notice is given of Mr. Harvey's Squid, in which a length of 17 feet

[1] *Op. cit.* p. 344, *Loligo*, pl. iv. See also the terminal expansion of the tentacles, op. cit. *Ommastrephes*, pl. i. fig. 1.

[2] Transactions of the Connecticut Academy of Arts and Sciences vol. v. part 1 (1880).

is assigned to the preserved portion of the tentacle, and a diameter of $1\frac{1}{4}$ inch to the largest tentacular acetabulum. Mr. Alexander Murray, Provincial Geologist of Newfoundland, agrees, from observation of the preserved specimens, with Mr. Verrill in these admeasurements.

Dr. Packard[1] has assigned the name *Architeuthis princeps* to Mr. Harvey's great Newfoundland Teuthid; but no generic characters are noted.

Mr. A. Verrill, in the paper above cited, gives an instance of a Squid captured in Coomb's Cove, Fortune Bay, in the year 1872, and quotes the following admeasurements, made by the Hon. T. R. Bennett, of English Harbour, Newfoundland, as being "perfectly reliable":—

	feet.
Length of body (probably including the head)	10
Length of the tentacle	42
Length of one of the ordinary arms	6

The cups on the tentacles were "surrounded by a serrated edge, like the teeth of a hand-saw."

Of another specimen, taken in Trinity Bay, Newfoundland, September 24th, 1877, the following admeasurements are recorded:—

	feet.	inches.
Length of the body to the base of the arms	9	5
Circumference of the body	7	0
„ „ head	4	0
Length of the longest cephalic arm (fourth)	11	0
Circumference of its base	1	5
Diameter of a large sucker	0	1
Length of the tentacle	30	0
Length of terminal expansion of tentacle	0	8
Circumference of stem	0	5

The above admeasurements are given on the authority of the Rev. M. Harvey.

In the 'Sitzungsberichte der Gesellschaft naturforschenden Freunde zu Berlin,'[2] Dr. F. Hilgendorf records observations of a huge Teuthid exhibited for money at Yedo, Japan, in 1873. It unfortunately, when seen by the author, lacked both the head and abdominal sac; the arms also were more or less injured; and the tentacles had been amputated at mid-length[3]. In the arrangement in double series of the horn-lined

[1] American Naturalist, vol. vii. p. 91 (Feb. 1873).

[2] No. 4, 1880.

[3] "Der Eingeweidesack entfernt, der Kopf ebenfalls ausgenommen und dessen Haut aufgeschnitten und von der Körperhaut getrennt, die Arme mehr oder weniger geschädigt, die beiden Fangarme in der Mitte abgeschnitten."—*Ibid.* p. 65.

suckers the specimen agreed with the Loliginidæ, in which family *Ommastrephes illecebrosa*[1], *O. pelagicus*[2], and *O. vanicoriensis*[3] repeat the character of the posterior confluent fins ("mit einander verwachsene Flossen am Hinterleib").

In portions of a similarly large Squid exposed for sale in the Yedo fish-market Dr. Hilgendorf subsequently noticed the thickened end of the two longest arms ("das verdichte Endstück der beiden längsten Arme," *l. c.* p. 67); and, concluding that such arms could not belong to a species of *Ommastrephes*, he proposes for the great Japanese Squid, to which he assumes them to belong, the generic name *Megateuthis*. But it may be questioned whether this enlargement of the ventral arms may not exemplify a sexual rather than a generic character[4]; no other is assigned save that of size.

The following admeasurements are given of the original subject:—

	centim.
From the hind end of the mantle to its fore border along the back . .	186
Length of the longest of the eight arms	197

The extreme size assigned by Aristotle to one of his *Malakia* is to a Decapod; and this squares in the main with that of Cook's Hooked Squid; the brief notice[5], as usual, favourably contrasts with the marvellous Cuttles of his uncritical successor Pliny.

Any notice of Cuttlefish seen from the deck by seamen of any grade, the admiral inclusive, is unavailable for the prosaic naturalist, when no part of the alleged monster has been obtained, preserved, or described by a competent zoologist. To him the report, for example, transmitted by the Minister of the Marine to the Academy of Sciences, Institute of France, and given in the 'Comptes Rendus,' 30th December, 1861, is unavailable by reason of the commander of the war-ship 'L'Alecton' forbidding the means of capture.—"Officiers et matelots me demandaient à faire amener un canot et à aller garrotter de nouveau l'animal et l'amener le long du bord. Ils y seraient peut-être parvenus, mais je craignais que dans cette rencontre corps à corps le monstre ne lançât ses longs bras armés de ventouses sur les bords du canot, ne le fît chavirer et n'étouffât peut-être quelques matelots dans ses fouets redoutables chargés d'effluves électriques" (p. 1264).

From the accompanying statement of the scene in the Pacific Ocean, its subject seems certainly to have been a Cephalopod, not a Torpedo. The dimensions of the "*Poulpe* monstrueux, qui nageait à la surface de l'eau, et mesurait de 5 mètres à 6 mètres de

[1] D'Orb. ut suprà, *Loligo*, pl. iii. [2] Ibid. pl. xviii. [3] Ibid. pl. xxi.

[4] See Steenstrup in 'Kongelige Danske Videnskabernes Selskabs Skrifter,' 5te Række, Bind iv., 4to, 1856.

[5] "οἱ τεῦθοι καλούμενοι ἐπιπολὺ μείζους· γίγνονται γὰρ καὶ πέντε πήχεων τὸ μέγεθος."—Arist. Hist. Animal. lib. iv. cap. i. 8. "But the so-called Squids (Loliginidæ) are much the largest (of the *Mollia* or Cephalopods); some even attain the length of 5 cubits," probably equivalent to 7 feet 6 inches English. The Greek πῆχυς is usually taken at $10\frac{1}{4}$ inches.

longueur" (p. 1265), are affected by the same conditions of guess and emotions as are those of the 60 feet ascribed by the Newfoundland fishermen to their assailant. "Les yeux, à fleur de tête, avaient un développement prodigieux et une effrayante fixité. Sa bouche, ou bec de perroquet, pouvait offrir près d'un demi-mètre" (*ibid.*) The character of the eyes squares with a species of *Ommastrephes*; a beak of about 2 feet diameter recalls the dimensions assigned to the same part of this Squid by the Newfoundland fishermen.

The statement by the estimable naturalist Péron[1]:—"non loin de l'île de Van Diemen, nous aperçumes dans les flots, à peu de distance du navire, une énorme espèce de Sépie, vraisemblablement du genre Calmar, de la grosseur d'un tonneau," adds to our knowledge of the geographical distribution of large Cephalopods, but not to that of their exact dimensions.

Steenstrup's notice[2] of a large Cephalopod is of more worth, though made on fragments only of a specimen which the fishermen of the coast of Jutland had cut to pieces for bait. The mouth (or part corresponding to the subject of Plate XXX. fig. 2 and Plate XXXI. fig. 1 of the present paper) is somewhat vaguely stated to be "of the size of an infant's head." It is referred to a decapodal genus, *Architeuthis*, as *Architeuthis dux*. Another large species, seen or taken on the coast of Greenland, is noted by the same estimable naturalist as an *Architeuthis monachus*; but the generic distinction from *Ommastrephes*, d'Orb., is not given.

The Mediterranean Calamary obtained by Eschricht at Marseilles, and now, or part of it, preserved in the Museum of Copenhagen, is stated to be 1 mètre 850 millims. (French) =6 feet 1 inch (English) in total length, tentacles and trunk included—*i. e.*, I conclude, in the position in which *Enoploteuthis cookii* is restored in Plate XXXIII. fig. 1. Here we have an allied Decapod of about the same length, "vela" being developed from some of the cephalic arms. Prof. Steenstrup has assigned to Eschricht's large Mediterranean Squid the name *Ommastrephes pteropus*.

The largest Cephalopod described in the great work of Férussac and d'Orbigny is the *Ommastrephes giganteus*[3]. To this species M. d'Orbigny assigns:—"Longueur totale 1 mètre 110 millim." (3 feet 8 inches), "longueur du corps 440 millim." (1 foot $4\frac{1}{2}$ inches). It is not stated whether the admeasurement of total length included the outstretched tentacles with the head and body. But in any case the size counted as gigantic falls far short of that evinced by the brachial arm of *Plectoteuthis grandis* and the admeasured parts of the great Squids captured in Fortune Bay and Trinity Bay, Newfoundland.

The character of unusual size is not limited to the Decapod division of Cephalopoda; but the evidence of alleged monstrous Poulpes (Octopoda) is less exact.

[1] 'Voyage aux Terres Australes,' tome i. p. 18.

[2] Oplysninger, &c., 'Forhandl. Skandinav. Naturforsk. Christiania,' 1857, pp. 182–185.

[3] *Op. cit.* p. 350, Calmars, pl. xx.

In the account given by the government diver of the colony of Victoria, Australia, in his Report, as cited in the weekly journal entitled 'The Colonies and India'[1], it appears that, pursuing his avocation in the estuary of the river Moyne, and having occasion to explore a hole in the bed, "his arm was seized by the tentacles of an Octopus, part of which he brought to shore, after mutilating his assailant with strokes of 'a small iron bar.'" This part, probably consisting of the head with more or less of the crown and arms, "being laid out, measured over 8 feet across."

We may assume this measurement to have been taken from the tip of one outstretched cephalic arm to that of the opposite arm. Now the length of the longest arm of my Australian *Tritaxeopus* (Plate XXIII. fig. 1) is 1 foot 11 inches; the breadth of the head intervening between the third pair of arms is 2 inches 2 lines; so, from the tip of one of such arms to the opposite one gives 4 feet.

If the Victorian diver took his measurements from tip to tip of the corresponding pair of acetabuliferous arms, and we deduct the breadth of the intervening part of the head according to the scale of *Tritaxeopus*, the length of such outstretched arm of the Moyne-river Octopod may be set down as 3 feet 10 inches; and the extent of the pair, with the intervening head reckoned at 4 inches 4 lines in breadth, would give 8 feet 2 inches, closely agreeing with the diver's statement.

Stretching out the first dorsal pair of arms in a line with the body, the total length of *Tritaxeopus cornutus* is 1 foot 6 inches; allowing the like proportion to the dorsal arm of the Moyne-river Octopod, its total length may be set down as 3 feet.

The ascertained differences in the proportions of arms, head, and body in the known species of Octopods do not, as a rule, support an inference of any notable error in the dimensions above estimated of the Moyne "Monster or Devil-fish," respecting which the diver states:—"After a while I found the grip begin to relax a little; but he held on until I had almost cut him to pieces; and then he relaxed his hold from the rock, and I pulled him up." This statement, with that of the circumstances of the first attack, viz. the seizure of the diver's arm, which he had thrust into a hole, by an arm of the Octopod, exemplifies the same habits of that form of Australian Cephalopod which have been noted in our common European *Octopus*.

There seems then to be no sufficient ground for the heading "Conflict of a Man with a Gigantic or Monster Cuttlefish," superposed to the government diver's Report, copied from the official statement into the journal above cited. The assailant seems not to have been more than thrice the ordinary average size of the *Octopus vulgaris*.

Fig. 4.

An Octopus with sucker-bearing arms of from 3 to 4 feet length, may well have afforded the subject of the accomplished Japanese sculptor (cut, fig. 4), whose work is graphically de-

[1] Number for 24th January, 1880.

scribed in the subjoined paragraph of an article in 'Land and Water' by my friend Frank Buckland, M.A., F.Z.S.:—

"This carving is an inch and a half long, and about as big as a walnut. It represents a lady in a quasi-leaning attitude; and at first sight it is difficult to perceive what she is doing; but after a while the details come out magnificently. The unfortunate lady has been seized by an Octopus while bathing (for the lady wears a bathing-dress). One extended arm of the Octopus is in the act of coiling round the lady's neck, and she is endeavouring to pull it off with her right hand; another arm of the sea-monster is entwined round the left wrist, while the hand is fiercely tearing at the mouth of the brute. The other arms of the Octopus are twined round, grasping the lady's body and waist: in fact, her position reminds one very much of Laocoon in the celebrated statue of the snakes seizing him and his two sons. The sucking-disks of the Octopus are carved exactly as they are in nature; and the colour of the body of the creature, together with the formidable aspect of the eye, are wonderfully represented."

This work of art is in the possession of Mr. Bartlett, of the Zoological Gardens.

The exciting incidents with which M. Victor Hugo adorns his narrative of 'The Toilers of the Sea' relate to the attacks of a large Poulpe. The fishermen of the Channel Islands and opposite coast of France retain the belief in a still huger species, which coils its cable-like arms about the mast of the sailing-vessel and capsizes the craft, the crew of which it devours. De Montfort, in his 'Histoire Naturelle des Mollusques,' admitted a figure of the achievement of the monster "Pieuvre;" but this, with the "Kraken" and the "Great Sea-Serpent," still remains a denizen of the dreamy ocean of credulity and romance[1].

Sufficient, however, of the evidence needed by the naturalist has been obtained to demonstrate that the greatest bulk in the molluscous subkingdom is attained by members of its most highly organized class; in this also is manifested the most extensive range of the character of individual bulk.

From the diminutive *Cranchia*[2], size rises, in the dibranchiate Cephalopods, to that of Cook's hook-armed Squid, to that of the castaway on the Island of St. Paul (fig. 3, p. 157), to the still greater dimensions of the assailant of the Newfoundland fishing-boat, and to that of the huge possessor of the subject of Plates XXXIV. and XXXV.

Far back in time, moreover, a similar series of specific dimensions is indicated by remains of extinct members of the lower or tetrabranchiate order of Cephalopods. Their chambered and siphonated shells ranged from diminutive kinds not surpassing

[1] Other references to recorded gigantic Cuttlefishes, with judicious critical remarks, will be found in the instructive work entitled 'The Octopus; or, the "Devil-fish" of Fiction and of Fact,' 12mo, 1875, by Henry Lee, F.L.S., F.G.S., F.Z.S.

[2] Trans. Zool. Soc. vol. ii. pl. xxi. fig. 1. I do not cite *Loligo laticeps* (fig. 6) or *Octopus semipalmatus*, because they were taken from an extensive mass of the *Sargassum* or Gulf-weed, a favourite breeding-place of pelagic Cephalopods, and were probably immature specimens of their species (p. 111).

that of the modern *Spirula* to a coiled Ammonite (*Am. leptophyllus*, Bedwell) 4 feet in diameter; and of the straight camerated kinds (Orthoceratites) Dr. Bigsby has noted a specimen of *Huronia vertebralis* in the cliffs of Drummond Island 6 feet in length. The constructors and occupants of such shells may have approached in size to the larger naked Cephalopods recorded in the present paper.

DESCRIPTION OF THE PLATES.

PLATE XXIII.

Tritaxeopus cornutus, Ow.

Fig. 1. Dorsal view, three quarters natural size.
Fig. 2. Oral environment, one quarter natural size.

PLATE XXIV.

Sepia palmata, Ow.

Fig. 1. Dorsal view, natural size.
Fig. 2. Sepium or "cuttle-bone," natural size.

PLATE XXV.

Sepia palmata, Ow.

Fig. 1. Ventral view, natural size.
Fig. 2. Sepium, natural size.

PLATE XXVI.

Sepioteuthis brevis, Ow.

Fig. 1. Ventral view, dissected, natural size.

Sepiola oweniana, d'Orb.

Fig. 2. Male organs of generation, magnified.

Loligopsis ocellata, Ow.

Fig. 3. Oral environment, natural size.
Fig. 4. Transverse section of cephalic arm, magnified.
Fig. 5. Sucker, showing denticulate hoop, magnified.
Fig. 6. Upper mandible, natural size.
Fig. 7. Lower mandible, natural size.
Fig. 8. Gladius or " pen," less than natural size.

PLATE XXVII.

Loligopsis ocellata, Ow.

Fig. 1. Ventral view, natural size.
Fig. 2. Dorsal view of head and part of mantle, natural size.

PLATE XXVIII.

Ommastrephes ensifer, Ow.

Fig. 1. Dorsal view, half natural size.
Fig. 2. One of the largest suckers and denticulate hoop, natural size.

PLATE XXIX.

Onychoteuthis raptor, Ow.

Fig. 1. Dorsal view.
Fig. 2. Ventral view, dissected.
Fig. 3. Digestive organs.
Fig. 4. Circulating and respiratory organs.
(Natural size.)

PLATE XXX.

Enoploteuthis cookii, Ow.

Fig. 1. Upper mandible.
Fig. 2. Both mandibles or beak, with inner lip reflected.
Fig. 3. Lower mandible.
(Natural size.)

PLATE XXXI.

Enoploteuthis cookii, Ow.

Fig. 1. Vertical longitudinal section of mouth, natural size.
Fig. 2. Ventral surface of pinnigerous termination of body.
Fig. 3. Dorsal surface of pinnigerous termination of body.
Fig. 4. Section of pinnigerous termination of body.
(Figs. 2–4 much reduced.)

PLATE XXXII.

Enoploteuthis cookii.

Fig. 1. Terminal portion of a cephalic arm, natural size.
Fig. 2. Cut end of ditto.
Fig. 3. Section of basal part of ditto.
Fig. 4. Section of uncigerous acetabulum.
Fig. 4′. Outline of ditto, magnified.
Fig. 5. Section of uncigerous acetabulum.
Fig. 5′. Outline of ditto, magnified.
Fig. 6. Section of systemic ventricle, natural size.

PLATE XXXIII.

Fig. 1. Restoration of *Enoploteuthis cookii.*
Fig. 2. Tentacle of *Architeuthis princeps*, less than natural size.

PLATE XXXIV.

Plectoteuthis grandis.

Fig. 1. Dorsal surface of cephalic arm and vela, from a section near the base.
Fig. 2. Acetabuliferous surface of termination of the arm.
(Natural size.)

PLATE XXXV.

Plectoteuthis grandis.

Fig. 1. Transverse section of non-acetabuliferous base of cephalic arm.
Fig. 2. Acetabuliferous surface and vela of basal part of the arm.
Fig. 3. Side view of a basal acetabulum.
(Natural size.)